SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXIII.---No. 2. [NEW SERIES.] NEW YORK, JULY 9, 1870. $3 per Annum [IN ADVANCE].

Launching of the Great Caisson for the Brooklyn Terminus of the East River Bridge.

The launching of this caisson, which was quickly and easily accomplished on the 19th March of the present year, was justly considered a noteworthy feat of engineering. Our readers may get some notion of the magnitude of this immense mass of wood and iron when we recall the statement of the Chief Engineer, contained in his report, published in our last issue, to which the reader is referred.

Fig. 1

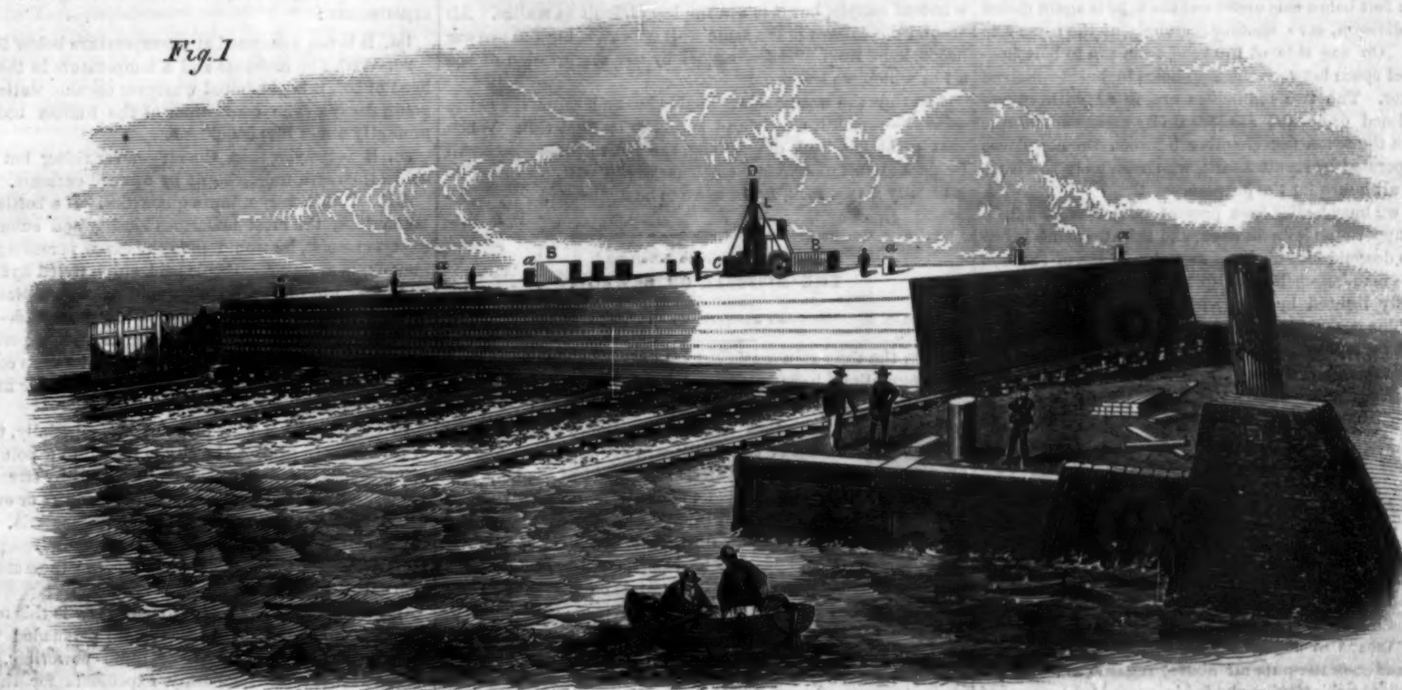


Fig. 2

Fig. 3

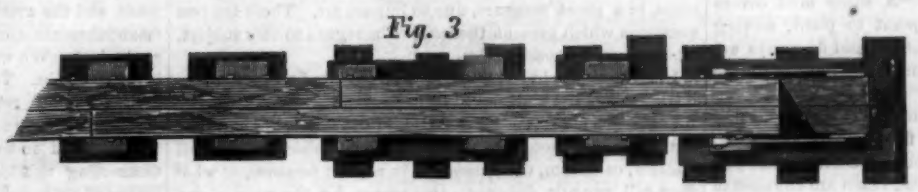


Fig. 5

Fig. 4

LAUNCHING OF THE CAISSON OF THE EAST RIVER BRIDGE

Our engravings show the caisson on the ways, as it appeared when ready to be launched, and also some details by which the construction of the ways and the plan of procedure in making the launch may be comprehended.

The structure was put together with its longer side parallel to the river bank, and about 100 feet distant from it, and the ways upon which it rested were seven in number, and each about 180 feet in length. These ways were laid in such a manner that their upper faces were curved to a radius of about 312 feet, and at a slope which made the chord of this arc form an angle of about 5°, the curved sine of the arc being some 13 inches, and the upper ends of the ways 15·6 feet higher than the lower ends. By this means an accelerated motion was given to the caisson in the latter part of its transit, the increased velocity it thus obtained enabled it to overcome the great resistance it encountered from the water when it struck the river broadside on. The details show the form given to these ways, and it will be observed that they rest upon cross and longitudinal timbers; the letters, *f g*, refer to the bearing pieces of the fixed ways, and *e f*, to the sliding ways attached to the underside of the caisson. The surfaces of the former of these were cut to an angle, as shown, that of the corresponding slide being made to fit, in order to insure a perfectly true motion of the caisson in the process of launching. Besides this, timbers, *h l*, were bolted to the inside of the two outer ways, which projected above the sliding surface, in order to check any swerving tendency. To insure a means of casting loose the caisson from every point at the same moment, a check cam, shown in the detail, was fixed into each of the ways near the upper end. The cam at the point where it took the bearing of the sliding way was provided with a projection which held it fast against the timber, and it was kept immovable by means of a lever secured by ropes at its extremity. These ropes being cast off simultaneously the cams were thrown over, and the caisson was free to move equally throughout its length. The position of the caisson upon the ways when ready for launching is clearly shown in the figures. The position of the air chamber is indicated by the dotted lines, H, K, L, and at E is shown a partition, which was constructed to divide the air chamber, and prevent the air from any sudden movement from one part of the caisson to another, which would have affected its stability. The dotted lines, C D, show the position assumed by the structure just as it left the ways, and E F represents it after it had been launched and had come to rest in the water.

In connection with this subject, a description of a visit to and

A DESCENT INTO THE CAISSON.

furnished us by one of two gentlemen, whose curiosity recently rose superior to all fears of the inconveniences and discomforts which—to novices—attend the descent, will be read with interest. It is as follows:

Save the employment of one gang of men above and one below for the completion of some extra service, the day's work on the caisson had ceased, when we two busy *bees* (or busy-bodies, if you prefer that term) presented ourselves at the entrance gate adjoining Fulton Ferry. We were neither engineers nor experts, nor did we propose an examination on which a scientific report might be based. The gratification of a great curiosity, to see with our own eyes the condition and mode of conducting one of the grandest engineering projects of the age, was the sole impelling motive.

We were made the more cheerfully welcome because we had chosen an off-hour for our visit; and that circumstance contributed to our own gratification, because it afforded better than usual opportunity for an undisturbed inspection of the work in all its parts.

The caisson inclosure extends some 250 feet along the river front, and thence back about 300 feet. The caisson itself has a frontage on the river of 168 feet, and a depth of 102 feet, the basin in which it is being sunk extending a few feet more in each direction. The caisson is, in effect, a box made of heavy timbers, sixteen feet in depth, and divided by like heavy timbers into six compartments. This great compartmented box, without a cover, was turned bottom upward and floated over the spot which it now occupies. Several layers of timber were then securely bolted over the entire upper surface, increasing its already immense strength, and sinking the structure until its sharp edges—protected by heavy iron plates—rested upon the bottom of the basin.

The problem was, and is, to sink this enormous caisson through mud and earth and boulders forty or more feet, until a firm ground is reached, there to leave it as the foundation for the immense towers of the bridge that is to be constructed. This is effected by maintaining and constantly changing an atmosphere, and at the same time excluding the water from each of the compartments of the caisson; thus furnishing means for carrying on the work of excavation to the best advantage. The means to this end are a supply of air forced by steam-driven pumps through pipes and hose into

the caisson chambers, and a sufficiency of weight on the upper surface of the caisson to counteract the buoyancy alike of timber and air, and maintain the caisson at all times, firmly, on the bed of the excavation. This weight is provided by commencing at once the erection of the towers. For this purpose the entire surface of the caisson is covered with blocks of heavy stone, the interstices of which are filled with the best cement. As the caisson sinks other tiers of stone will be added, and when it rests upon its final bed the towers will be carried up their full hight.

The method whereby the workmen enter and leave their workrooms at the bottom of the caisson—already fifteen or twenty feet below the surface of the water and growing deeper day by day—and the method of removing the earth and rocks which they dig out are matters of greatest interest. To drive the water out of the caisson requires a pressure of air inside equal to six pounds to the inch. The workmen must therefore go in and out and take out the material excavated without leaving any open space through which the air could escape. And how is this done?

Down through these tiers of stone and timber—from the outer air to the inside of the caisson—is placed a tube of boiler iron some six feet in diameter. The upper end of this tube is closed, save a man-hole of perhaps 18 inches diameter. About seven feet below this upper end the tube is again closed by an iron division, save another man-hole of the same size as the first. On one side of the tube, from top to bottom—the seven feet space between the man-holes included—is fixed an iron ladder. The two man-holes are fitted with covers which are closed or opened at pleasure by means of suitable appliances in the seven feet chamber between them. These covers are operated by an attendant, who remains in the little chamber, at all hours, for the purpose.

And now we busy-bodied-bees present ourselves for admission. The upper man-hole is open, and the attendant below directs us to descend into his little room by means of the iron ladder. The man-hole below is tight closed. The little room is abundantly lighted by heavy glass set in the iron-work overhead. The cover to the man-hole by which we entered is now closed by a few turns of the windlass, and we three are cased in the strongest of iron prisons. Before we can feel the effects of our confinement the attendant opens a small valve which communicates by means of a pipe, with the space below the iron floor on which we stand. An unearthly and deafening screech, as from a steam whistle, is the immediate result, and we instinctively stop our ears with our fingers to defend them from the terrible sound. As the sound diminishes we are sensible of an oppressive fullness about the head, not unaccompanied with pain, somewhat such as might be expected were our heads about to explode. Meanwhile the sound stops entirely; the lower man-hole is opened, and the attendant directs our attention to the iron ladder below as the means of descent. The first determination is to draw back and gain the pure air above, regardless of failure to accomplish the object of our visit, is succeeded by a sober second-thought, and in spite of present pain we drop through the man-hole and down the ladder as though life depended upon the celerity of our movements and the brevity of our explorations. But as the seconds fly we become accustomed to the "situation." The pressure on the head is relieved so that in three or four minutes we feel quite at ease. We place ourselves under the care of the superintendent in charge, Mr. Charles Young, foreman of the caisson, and are conducted from point to point until we have obtained a very satisfactory idea of the principles on which the work is conducted. The compartments, which are each some forty-five feet square, appear very much like the cellars of houses which have for months been submerged by the overflow of an adjacent river, and are now newly freed from water. A slimy mud covers everything. Planks are laid from point to point, serving alike as ways for feet and barrow-wheels, and doorways are cut through the different compartment partition walls to facilitate the passage between them.

In one of the compartments, as already intimated, we find the work going on, while the other five are dark and dank; slimy and silent. A single great boulder obstructs the progress downward of the caisson, and these men are engaged in its removal. They have dug around the inner side of it, but the excavation is filled with water. Indeed the boulder is concealed in the water, and they work at it, thigh deep, in the muddy liquid. They have drilled a hole and inserted an eye-bolt, such as is used in raising a large stone to its place on the walls of some great building. The boulder weighs ten, or it may be twenty tuns, and besides that is so bedded in mud that a power equal to twice its weight is required to loosen its hold. That power is obtained by means of an hydraulic jack. Unlike the usual lifting jack, in use for raising great weights, this one is so contrived as to exert the same power in pulling the weight. The water chamber of the jack is above and not below the piston, and the piston rod terminates in a hook instead of a lifting shoulder. This hook being first attached to the eye keyed into the boulder, and the opposite end of the jack chained fast to the nearest inner timber partition, the pump which forms part of the jack is put in motion. When the strain is fairly made the boulder yields and is drawn into the compartment. Here it is speedily drilled through and broken into manageable pieces. Let us follow them.

Down through the layers of stone and timber there reaches from the upper air to the level of the bottom edges of the caisson a huge square box, some eight or ten feet on either side, open at both ends. The water which is driven out of compartments where the work goes on, by the great air pumps, rises freely in this box to the level of the river beyond. As the caisson sinks the workmen dig around and under the lower edges of the box, keeping a space under it free from earth. Inside the box is a steam-operated lifter, so constructed as to dip great buckets full of whatever of earth or stones may be found at the bottom. It is, in short, a dredging machine, and is operated as such. It dredges out the earth below the box to a depth greater than that reached by the caisson, and thus forms, as it were, a cistern or space filled with water below the box. This cavity or cistern extends beyond the box itself into the working compartments on either side.

Hither the workmen bring the broken pieces of rock, the mud and earth, or such material as may have been excavated. It is thrown into the cistern, is dipped up by the dredger buckets, and lifted *through the water* into the upper air, there to be finally removed. The process is simple enough, and yet one almost wonders to stand at ease near the bottom of such a box—two of them are in use—and consider it as without either cover or bottom and yet full of water to a hight of a dozen feet above the head. The way is open, apparently, for the water to run out, and yet the flood is stayed! But that we have become accustomed to the condensed air in which we stand, and have forgotten that it exerts a pressure of six pounds to the square inch upon that water, and thus presses it up into the box and holds it up there to a hight of nearly twenty feet, we should not thus wonder. The process *is* indeed simple, but it is not the less difficult to realize. All around the caisson is the same wall of water, high above our heads, kept from overflowing us by the compression of the air in which we stand.

And thus the workmen are enabled to undermine the entire caisson—to sink it slowly and surely to its final rest. When that point has been determined, the entire inner space will be packed full of cement, and the whole will became substantially a vast rock, never more to be disturbed.

B. & B.

[For the Scientific American.]

THE DISPOSAL OF SEWAGE.

BY PROF. JOHN DARBY.

From the time men gathered into communities, some sanitary regulations have been adopted. It required no long experience, on the part of the members of a thickly peopled locality, to teach them that aggregation, alone, was a cause of disease. The reason of this result was not apparent; but the existence of the fact led to the establishment of hygienic regulations, which were supposed to have a bearing on the subject. The accumulation of filth, in a crowded population, was considered a prolific cause of disease. To get rid of this was the problem. Moses purified his camps by fire, or by regulations that carried the offensive materials off too far for them to exert any deleterious influence. To remove these morbific elements from cities, sewers were an early means. It was presumed that, by running water in sewers, all the decaying matter could be transported to a river or the ocean, and be lost or consumed in the abundant waters. Rome stood upon a net-work of sewers (*cloacæ*), and its vast population, in ancient times, owed, undoubtedly, their exemption from desolating diseases to the perfection of its sewage.

The subject of sewage has received the profoundest attention of the most learned and practical men in all the great cities of Europe. The best engineers and the most learned hygienists of Paris and London have spent their best energies on this subject; and the effect of their labors has been, undoubtedly, of great good. In the city of New York, similar labor has been expended, and similar happy results have followed. But all that is desirable has not been accomplished. Efforts are unabated to accomplish still greater results. No less than 7,455 deaths occurred in this city, in 1868, by diseases, in a great measure, due to impure air. There are two questions which present themselves in regard to this subject, which require consideration.

1st. What is it in the air that is so fatal to human life?

2d. How is the material to be destroyed?

There has never been any doubt in the minds of observers, that there was present in the air a material, which they called malaria, or miasm, the generator, in a great measure, of what they call zymotic diseases. One reason, for the want of success in removing entirely this destructive agent, is due to the fact, that its true properties have not been discovered or acted upon. Importance, also, has been given to agents that exerted no influence in the case. Carbonic acid has been sought for, found, and estimated in unhealthy localities. Carbonic acid exerts no influence in producing disease. It is a comparatively harmless gas. Le Blanc says carbonic oxide is twenty-five times more poisonous than carbonic acid, which is equivalent to saying that carbonic acid is not poisonous at all, which we have good reasons for believing. The amount of carbonic acid is always too small to exert any deleterious influence in the most malarious localities. It never amounts to more than one third of one per cent, which is too small a quantity to produce any injurious effect.

It is true that carbonic acid may accumulate in wells, cisterns, sewers, or caves, and suffocate any one descending into them. It is a heavy gas, and has slight diffusive power, and hence, will remain for some time in a close place, where it is generated. It suffocates, in these cases, as any other gas would do with like diffusive power.

It produces no zymotic diseases. The workmen in soda-water works breath an atmosphere often much more highly charged with carbonic acid than in any natural localities, and yet are perfectly healthy.

Angus Smith says, that a deficiency of oxygen, or the accumulation of carbonic acid is not the cause of the injury, but the discharging into the air some organic substance. Whatever this substance may be, as to its real nature, whether germs, puterine, organic nitrogen, or albuminoid ammonia, is of little or no consequence; its properties and effects are beyond dispute. That it is a producer of disease there is no question. In sixty-eight places, in England, the death rate was in direct relation to the quantities of this material in the air. It is to this organic substance that attention is directed.

To detect this material, we devised a means more than ten years ago. We attached to an aspirator one of Liebig's potash bulbs, containing a dilute solution of permanganate of potash; and as the water passes out of the vessel, a like quantity of air passed through the bulb, and any organic matter was indicated by the change of color of the permanganate from a deep reddish purple to a colorless solution. Care must, however, be taken to previously deprive the air of any sulphureted or phosphureted hydrogen; which is easily done. By this means the air can be tested from any locality or place wherein an india-rubber tube can be inserted—from cellars, bed rooms, or in the beds, from drains, from the tops of houses, or above them, sewers, etc.

By the same arrangement of apparatus, ozone may be tested, by putting into the bulb a solution of iodide of potassium and starch, prepared in the same manner as for ozone papers, only more diluted.

The following facts are established in regard to malaria by experiments:

1st. It is not generated at a temperature below 50° Fah.

2d. With due moisture and a temperature in the neighborhood of 80°, it is generated wherever organic matter is undergoing decay. The emanations of the human body afford it promptly under like conditions.

3d. It is heavier than the air—never rising but a few feet above the earth unless borne by upward currents.

4th. It is in very minute quantities. If a bottle of air be taken from the most malarious locality and submitted to an expert chemist, he would give the exact percentage of nitrogen, oxygen, water, carbonic acid, sulphureted hydrogen, etc., and make up 100 parts, but would take no notice of this organic substance. The deficiency, if any, he would—and might justly—attribute to error in observation. The permanganate is specially fitted for its detection, from its deep color and excessive sensitiveness to the presence of organic matter, especially if undergoing change.

In the months of July and August, especially, the temperature of every part of the city is raised to a point favorable for miasmatic production. The sewers, filthy streets, inclosed yards, and all filthy places, whether indoors or out of doors, become foci for the discharge of active malaria. Here it is, entering our homes, invading the sleeping rooms, and, perhaps, generated there, unless scrupulous neatness and thorough ventilation is observed.

Our second question comes to us, "How is this organic substance to be got rid of?" We are persuaded that chemical disinfectants are nearly or quite powerless. They are mere partial and temporary expedients for the purification of a great city, however applicable they may be for a single dwelling. We can conceive of but two ways of accomplishing this result,—one by the agency of ozone, the other by fire. There is an abundance of ozone floating above our city, which, if it could be brought down, would soon cleanse our atmosphere. How is this to be accomplished? We see no practical means, and we know of no practical way in which ozone can be artificially produced, to accomplish the same end.

Can we apply fire?

In the city of New York there are twenty-nine sugar refineries, eighteen saw mills, 324 establishments for printing, nine flouring mills, sixty-five iron founderies, sixteen planing mills, ninety-five distilleries. From much inquiry that we have made, and the average we have been able to make, the above establishments consume 2,000 tuns of coal per day, or its equivalent. We will suppose they use but 1,000 tuns. This is 2,000,000 lbs. To burn this coal—supposing it to be pure carbon—would require 5,333,333 1-3 lbs. of oxygen. The amount of air required to afford this amount of oxygen, supposing it all to be consumed, would be 26,666,666 2-3 lbs. Converting this into cubic feet, on the fact that 100 cubic inches of air weigh 31 grains, we should get about 36,000,000 cubic feet, which would fill a sewer 4-ft. by 3, and 568 miles long. The sewers of this city make 260 miles in length, and they will not average 3x4-ft. A great part of the length of the sewers is tubes, from 1-ft. to 1 1-2-ft. in diameter. We may safely calculate that, with the burning of 1,000 tuns of coal, all the sewers of the city would be emptied three times a day, if the furnaces in which the coal is burned drew their air from the sewers.

The proposition is, to connect the furnaces or bellows with the adjacent sewers. No one will deny the feasibility of this adjustment. It is no new thing to draw air for a blast from below. The air furnaces in New England, fifty years ago, drew the air by a subterranean trench, from outside the furnaces. Many farmers' fireplaces were furnished with a hole between the andirons, covered, when not needed, with an iron plate. It fulfilled two purposes—to let the ashes into a brick bin, below, and to blow the fire from a current of air from the cellar. The feasibility we consider settled.

Some objections may be raised on other grounds. It may be said, that the air of sewers is not fitted to support combustion, as well as external air. The amount of oxygen will not vary one third of one per cent, as analysis shows. Moreover, the air in the sewer will be from ten to twenty degrees colder than that of the furnace room, whence the air is now drawn. For the condensation of the air by this lower temperature will make a cubic foot of air in the sewer contain more oxygen than a cubic foot of external air, allowing for all impurities.

But it may be said, the foul gases may interfere with com

bustion. All the gases, except carbonic acid, generated, including the malaria, are combustible, and will add fuel to the flame.

It may, also, be objected, that the air is damp. This is so. But the water is in the form of vapor, and not liquid, hence the thousand degrees of caloric are not required to convert the water into steam. This vapor, passing over the glowing carbon, would be decomposed, and, by no means, diminish the the intensity of the combustion, but rather increase it.

The advantages of this operation are manifest. In the first place, the offensive matters are burned up, and not allowed, as now, to be diffused through the air. By this process there will be a constant downward tendency of the foul airs to flow into the sewers, wherever generated, whether from the surface of the streets, or in dwellings, or outhouses. Like the water, they will all flow off into the sewers, and be drawn up into the furnaces. The tendency, now, is to accumulate and rise up as the quantity increases, and flow into the dwellings, instead of flowing from them. The sewers themselves are now centers of the foulest emanations, as any one may convince himself by experimenting on the air over the water holes at the corners of the streets.

It is feared by some,that the immense production of carbonic acid, and other noxious products produced by the manufactories of New York, may demand, sooner or later, their removal from the city. These fears, probably, have their origin in the analysis of the air in the great cities of England. They certainly have not arisen from the analysis of the air of New York. The cases of English cities and New York are very different. In the first place,the kinds of manufactories of New York are small or null in those materials which most load the atmosphere of some English cities. In the next place, we have a very different atmosphere. While theirs is moist, and loaded with vapors, ours is comparatively dry, and will not sustain them. Although immense volumes of carbonic acid are raised into the air, yet the winds, in a few minutes, will transport them to distant places.

This principle may be applied with much benefit to private dwellings. If the dwelling is furnished with a furnace, the air for combustion could be drawn from the lowest place on the premises,and the supply of air would come from the upper portions of the house, creating a tendency to ventilate the dwelling by pure air drawn from above. The cellars of private buildings might be connected with the sewers, and when the draft was strong, the stagnant air drawn out and fresh air supplied.

It might be objected, that circumstances might occur,when the air could not be drawn from the sewers from obstructions or from their being full. Then the usual source could be employed by removing the jacket, and the dampers in the tube be shut. Where the tubes are employed, and too small for the supply from accumulations of water in them, the furnace could be connected with the reservoirs for surface water at the corners of the streets. But the furnaces, generally, are in operation only in the daytime. Still, if the sewers are thoroughly aerated three times in twenty-four hours, no harm could result,certainly none when they are kept pure for twelve hours, and that in the hottest portion of the twenty-four.

Hotels might draw their air from the same source to their ranges and furnaces, and their premises supplied with pure air.

The only facts we have observed in examining the *literature* of sewers, that relates to this matter, are the following: A proposition was made, in London, to connect the sewers with the chimneys of manufactories, above the fires, which the owners objected to, from its diminishing the draft. In Paris, when the sewers become so foul that the workmen cannot enter them with safety, they have movable chimneys, which they put over the holes in the streets, and, by building a fire in the chimneys, draw out the foul air. This involves our principle, which we have discovered since the above was written.

It may be objected that insuperable difficulties would arise in putting the above views in practice. That difficulties would arise, is probable, but, that they are insuperable to the engineering talent of New York,we do not believe. We imagine the expense ot the various efforts now put forth for a partial success, if rightly directed, would achieve a perfect and permanent relief from malarial influences, and would supply the now most miasmatic districts with pure air.

WHAT IS ENERGY?

[Balfour Stewart in Nature.]

It has been shown in a former article (See SCIENTIFIC AMERICAN, page 360, Vol. XXII.), that energy, or the power of doing work, is of two kinds, namely, energy due to actual motion, and that due to position. We ended that article by supposing a stone shot vertically upwards had been caught at the summit of its flight and lodged on the top of a house; and this gave rise to the question, What has become of the energy of the stone? To answer this we must learn to regard energy, not as a quality, but rather as a thing.

The chemist has always taught us to regard quantity or mass of matter as unchangeable, so that amid the many bewildering transformations of form and quality which take place in the chemical world, we can always consult our balance with a certainty that it will not play us false. But now the physical philosopher steps in and tells us that energy is quite as unchangeable as mass, and that the conservation of both is equally complete. There is, however, this difference between the two things—the same particle of matter will always retain the same mass, but it will not always retain the same energy

As a whole, energy is invariable, but it is always shifting about from particle to particle, and it is hence more difficult to grasp the conception of an invariability of energy than of an invariability of mass. For instance, the mass of our luminary always remains the same, but its energy is always getting less.

And now to return to our question—What has become of the energy of the stone? Has this disappeared? Far from it; the energy with which the stone began its flight has no more disappeared from the universe of energy, than the coal, when we have burned it in our fire, disappears from the universe of matter. But this has taken place: the energy has changed its form and has become spent or has disappeared as energy of actual motion, in gaining for the stone a position of advantage with regard to the force of gravity.

If we study this particular instance more minutely, we shall see that during the upward flight of the stone its energy of actual motion becomes gradually changed into energy of position, while the reverse will take place during its downward flight, if we now suppose it dislodged from the top of the house. In this latter case the energy of position with which it begins its downward flight is gradually reconverted into energy of actual motion, until at last, when the stone reaches the ground, it has the same amount of velocity, and, therefore, of actual energy, which it had at first.

Let us now revert, for a moment, to the definition of energy, which means the power of doing work, and we shall see at once how we may gage numerically the quantity of energy which the stone possesses, and in order to simplify matters, let us suppose that this stone weighs exactly one pound. If, therefore, it has velocity enough to carry it up one foot, it may be said to have energy enough to do one unit of work, inasmuch as we have defined one pound raised one foot high to be one unit of work; and in like manner if it has velocity sufficient to carry it 16 feet high, it may be said to have an energy equivalent to 16 units of work, or foot-pounds, as those units are sometimes called.

Now, if the stone be discharged upwards with an initial velocity of 32 feet per second, it will rise 16 feet high, and it has therefore an energy represented by 16. But if its initial velocity be 64 feet per second it will rise 64 feet high before it turns, and will therefore have energy represented by 64. Hence we see that by doubling the velocity the energy is quadrupled, and we might show that by tripling the velocity the energy is increased nine times. This is expressed in general terms by saying that the energy or quantity of work which a moving body can accomplish varies as the square of its velocity. This fact is well known to artillerymen, for a ball with a double velocity will penetrate much more than twice as far into an obstacle opposing its progress.

Let us now take the stone or pound-weight having an initial velocity of 64 feet per second, and consider the state of things at the precise moment when it is 48 feet high. It will at that moment have an actual velocity of 32 feet per second, which, as we have seen, will represent 16 units of work. But it started from the ground with 64 units of work in it; what, therefore, has become of the difference—or 48 units? Evidently it has disappeared as actual energy; but the stone, being 48 feet high, has an energy of position represented by 48 units; so that at this precise moment of its flight its actual energy (16), plus its energy of position (48), are, together, equal to the whole energy with which it started (64).

Here, then, we have no annihilation of energy, but merely the transformation of it from actual energy into that implied by position; nor have we any creation of energy when the stone is on its downward flight, but merely the re-transformation of the energy of position into the original form of actual energy.

We shall presently discuss what becomes of this actual energy after the stone has struck the ground; but, in the meantime, we would repeat our remark how intimate is the analogy between the physical and the social world. In both cases we have actual energy and energy of position, the only difference being that in the social world it is impossible to measure energy with exactness, while in the mechanical world we can gage it with the utmost precision.

Proteus-like, this element, energy, is always changing its form; and hence arises the extreme difficulty of the subject, for we cannot easily retain a sufficient grasp of the ever-changing element to argue experimentally regarding it. All the varieties of physical energy may, however, be embraced under the two heads already mentioned; namely, energy of actual motion and of position.

We have chosen the force of gravity, acting upon a stone shot up into the air, as our example; but there are other forces besides gravity. Thus, a watch newly wound up is in a condition of visible advantage with respect to the force of the main spring; and as it continues to go it gradually loses this energy of position, converting it into energy of motion. A cross-bow bent is likewise in a position of advantage with respect to the spring of the bow; and when its bolt is discharged, this energy of position is converted into that of motion. Thus, again, a meteor, a railway train, a mountain torrent, the wind, all represent energy of actual visible motion; while a head of water may be classed along with a stone at the top of a house as representing energy of position. The list which represents visible energy of motion and of position might be extended indefinitely; but we must remember that there are also invisible molecular motions, which do not the less exist because they are invisible.

One of the best known of these molecular energies is radiant light and heat—a species which can traverse space with the enormous velocity of 186,000 miles a second.

Although itself eminently silent and gentle in its action it is, nevertheless, the parent of most of the work which is done in the world, as we shall presently see when we proceed to another division of our subject. In the mean time we may state that radiant light and heat are supposed to consist of a certain undulatory motion traversing an etherial medium which pervades all space.

Now, when this radiant energy falls upon a substance, part of it is absorbed, and in the process of absorption is converted into ordinary heat. The undulatory motion which had previously traversed the thin ether of space has now become linked with gross palpable matter, and manifests itself in a motion which it produces in the particles of this matter. The violence of this rotary or vortex-like motion will thus form a measure of the heat which the matter contains.

Another species of molecular energy consists of electricity in motion. When an electric current is moving along a wire, we have therein the progress of a power moving the light with enormous velocity, and, like light, silent in its operation. Silent, we say, if it meets with no resistance, but exceedingly formidable if it be opposed; for the awe-inspiring flash is not so much the electricity itself as the visible punishment which it has inflicted on the air for daring to impede its progress. Had there been a set of stout wires between the thunder-cloud and the earth, the fluid would have passed into the ground without disturbance.

The molecular energies which we have now described may be imagined to represent motion of some sort not perceived by the outward eye, but present, nevertheless, to the eye of the understanding, they may therefore be compared to the energy of a body in visible motion, or actual energy as we have termed it.

But we have also molecular energies which are more analogous to the energy of position of a stone at the top of a cliff.

For instance, two bodies near one another may be endowed with a species of energy of position due to opposite electrical states, in which case they have a tendency to rush together, just as a stone at the top of a cliff has a tendency to rush to the earth. If the two bodies be allowed to rush together this energy of position will be converted into that of visible motion, just as when the stone is allowed to drop from the cliff its energy of position is converted into that of visible motion.

There is finally a species of molecular energy caused by chemical separation. When we carry a stone to the top of a cliff, we violently separate two bodies that attract one another, and these two bodies are the earth and the stone. In like manner when we decompose carbonic acid gas into its constituents we violently separate two bodies that attract one another, and these are carbon and oxygen. When, therefore, we have obtained in a separate state two bodies, the atoms of which are prepared to rush together and combine with one another, we have, at the same time, obtained a kind of energy of molecular position analogous on the small scale to the energy of a stone resting upon the top of a house, or on the edge of a cliff on the large or cosmical scale.

Preservation of Freestone.

The *Hub*, a Boston cotemporary, in discoursing on the above subject, remarks that many methods have been adopted to preserve brown stone, and a number of patents have been taken out for preparations for this purpose.

In regard to the cause of the scaling of the brown stone so much used of late in this country, it would seem to be chiefly due to its porosity, whereby it absorbs water, which, in freezing beneath the surface,splits it apart by the expansion which water undergoes at temperatures below 39° Fah. This force of expansion is very powerful, as is shown by the rupture of water pipes, which so often burst in cold weather. It is frequently the case that these pipes do not crack until the temperature moderates and melts the cylinders of ice contained therein, and this has given rise to the delusion that it is the thawing which bursts them.

It has been theorized that the decay of the stone is due in part to the corrosive action of the sulphuric acid which exists in the atmosphere of large cities, proceeding from the coal there burned. Even if this theory be correct, the acid could not affect the stone unless absorbed into its pores with moisture. Stop these pores therefore, and the decay will be arrested. For this purpose the journal from which we condense this article recommends the varnish known as "Permanent Wood Filling." It says oil has been used on walls of brick and stone, but it soaks away before drying, and leaves but little at the surface where it is most needed, while the "Filling," being more viscid, remains in the surface pores until it hardens and closes them forever. This article, like most modern discoveries, was known in principle before the Christian era, and if Sextus Tarquin had not scowled on the *gypsy* we might perhaps have found in the sibylline books the formula for its preparation. It is at least certain that the asphaltum, which enters into its composition, was used by the Egyptians to preserve their dead, by impregnating the bandages in which they wrapped the bodies to make mummies; and after a trial of four thousand years, we are justified in calling this species of dry pickle *permanent*. In the fossil gums, moreover, which are also used in its composition, we find insects and leaves which have been handed down to us from antediluvian times, and which would indicate the preserving qualities of those gums. Is it not probable that if frail organic remains have been thus preserved by its ingredients, that they will as well protect a hard stone wall? To us it seems that nothing can be more durable than a surface composed of the elastic "Filling," closing the pores of the stone, and the silicous cells of the latter guarding the "Filling" from abrasion. The motives of reformers are often assailed, but the principles of natural philosophy are here in question and not the principles of men.

Improvement in Pumps.

The object of this invention is to so construct a pump for the use of ships and railways, and for domestic purposes, that the lower valve and seat, A, Fig. 1, may be taken out without taking up the pump.

It results from this construction that ships' pumps may be used without a strainer, as whatever may be drawn through the pipe into the barrel may be easily removed. This class of pumps most frequently clogs at the strainer, necessitating loss of time, often in cases of great emergency when minutes lost are lives lost.

For railways also the pump offers advantages, as the valve may be placed below the reach of frost, and be as readly removed for cleaning or repair as though it were near the surface.

The improvement consists in providing the valve seat, B, Fig. 2, with a bail, C, with which a hook, D, attached to a cord or formed upon the end of a rod, engages, and the valve seat and valve may be withdrawn and taken out at the top of the pump.

The valve seat is made tapering, to fit a similarly shaped recess at the bottom of the barrel of the pump, the wedging action being sufficient to hold it in place when the pump is in action, but offering but little resistance when the valve is desired to be removed. It also has a leathern packing, E.

The valve may be taken out of a ship's pump made in this way, all obstructions removed, the valve again replaced, and the pump put in operation, within five minutes from the stoppage of the pump.

Patented, through the Scientific American Patent Agency, July 27, 1869, by John W. Williams, of Syracuse, N. Y., whom address for further particulars.

Fig. 1

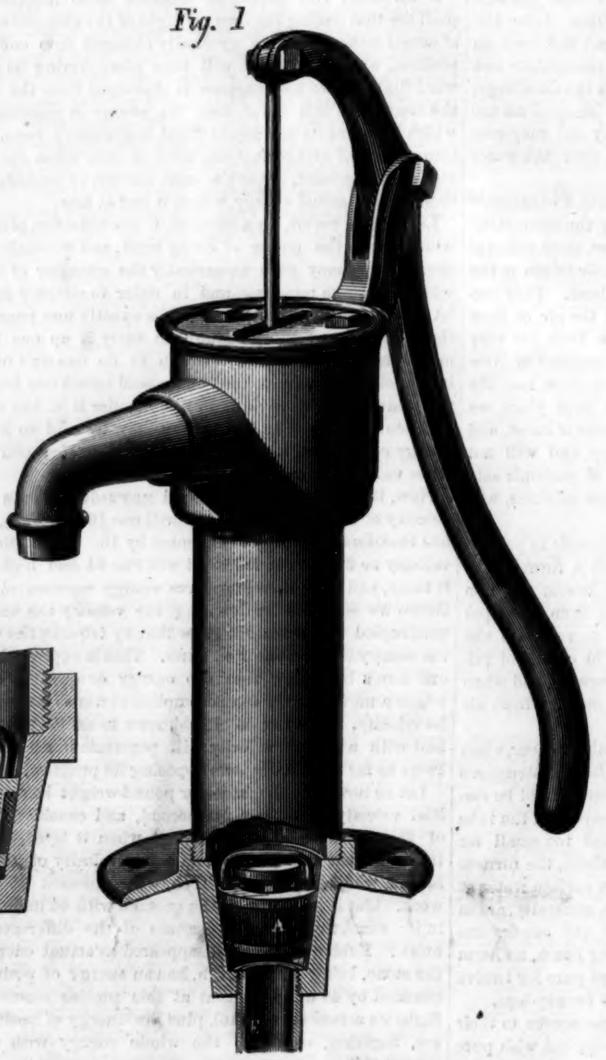
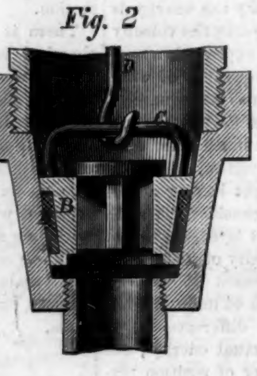


Fig. 2



WILLIAMS' IMPROVED PUMP FOR SHIP AND RAILWAY USE.

Mack's Patent Circulator.

Our engravings illustrate a new apparatus for the generation of steam, for which the inventor claims the merits of safety, economy, and freedom from incrustation, and which, therefore, will attract the attention of steam engineers and consumers.

Fig. 1 is a perspective view, and Fig. 2 a cross section, showing its construction. It will be seen that the boiler proper is mounted upon a circulator attachment, the object of which is to prevent the intense heat of the fire acting upon the boiler proper, and to present a thin body of water to the heat, which, by its constant circulation, will bring every particle of the water in the upper boiler over the immediate action of the fire, thereby rendering the boiler a reservoir for water and steam, and preventing violent commotion from extra heat in the boiler, wherein the steam and water will become distinctly separated, so as to leave the steam perfectly dry. It is also claimed that incrustation is likewise prevented, as the constant motion of the water in the circulator prevents deposits accumulating on it. The water enters the circulator from the bottom of the boiler to the lowest part of the circulator by the tubes, D, on each side, moving around the bars or stays, till both streams meet on the top or crown of the circulator, and enter the boiler by the pipe, E, at or near the water line.

B and C are the outer and inner plates of the circulator, between which are the stays or angle irons, A. B can be made of stronger and better material, or if made of copper, it will surpass iron for withstanding the effects of the heat.

Thus the water comes from the boiler at about the lowest point through two large tubes, and descends and enters the circulator at the lowest point of the same on opposite sides, thence passing around the bars (which are placed to guide the course of the water) on both sides, till they meet on the top or crown, where they enter by a tube back to the boiler again near the water line, where the steam and water become silently separated, the steam ascending, the water descending, to be again returned back through the circulator.

FIG. 1.

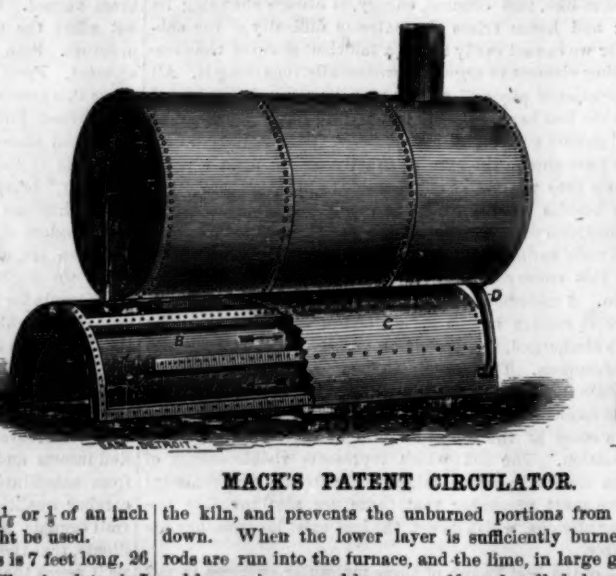


FIG. 2.

MACK'S PATENT CIRCULATOR.

The longitudinal bars, around which the currents move in the circulator, may be placed so as not to exclude the water entirely from the fire-plate, as they are only to guide the same in its course, therefore they do not require to be riveted like the outer edges. Rings or washers might be placed to raise the bars $\frac{1}{16}$ or $\frac{1}{8}$ of an inch from the plate, or hollow or fluted bars might be used.

The boiler represented in the engravings is 7 feet long, 26 inches in diameter, and has 21 3-inch flues. The circulator is 7 feet long, having $1\frac{1}{2}$ in. water space between plates, B and C. The feed pipes, D, are each $2\frac{1}{2}$ in. in diameter. The eduction pipe or tube, E, is $1\frac{1}{2}$ in. in diameter.

The bars or stays should be made hollow, or so raised by small washers under them that the water can pass under them—they are merely to guide the current of water in its course.

Patented by W. B. Mack, November 11, 1869. All communications relative to purchase of rights, etc., should be addressed to D. B. and H. M. Duffield, Jefferson avenue, corner of Griswold street, Detroit, Mich.

Lime Burning.

"The limestone quarries at Rockland," says the *Architectural Review*, "near the mouth of Penobscot Bay, Me., are at present worked on a more extensive scale than ever before. The old fashioned kiln for burning the limestone has been entirely superseded by the patent perpetual kiln, and a large amount of capital is invested in the business. The kilns are situated on the shore of a peninsula, and are built at the foot of a bank and at the head of a wharf. The kilns are constructed with walls of thick granite and lined with fire-brick, being eighteen feet square and thirty feet deep, narrowing towards the lower part. Each kiln will hold from one hundred and fifty to two hundred casks of lime, and a charge of limestone rock and fuel is burned in from seven to eight hours, and is drawn three or four times a day, according to the character of the rock. The lime, it is stated, swells in the kiln, and prevents the unburned portions from falling down. When the lower layer is sufficiently burned, iron rods are run into the furnace, and the lime, in large glowing red lumps, is removed by means of long handled shovels, and when cool is broken up, sorted, and packed in casks. The fuel is either wood or bituminous coal, the kilns using one cord of wood or two tuns of bituminous coal to produce the same yield. One hundred casks of lime consume in their manufacture four and a half cords of wood. The kilns and the fuel are covered by large sheds, the buildings for a pair of kilns occupying an area of seventeen thousand square feet.

Heat From Electric Currents.

Professor Tyndall, in a recent lecture, pointed out how the metal zinc is virtually "burnt" or made to enter into combination with oxygen, in the cells of the Grove's battery; the consequence is, that the temperature of the liquid in the battery cells is raised. If both ends of the battery be joined by a very short, thick copper wire, a definite amount of heat is produced in the cells; but if a thin platinum wire be placed in the circuit, so that the said wire shall be made red hot by the current, there is no additional creation of heat, for the temperature gained in the wire is compensated for by less heat generated in the battery cells. He also explained, that when an electrical current raises the temperature of a wire, it thereby creates increased resistance to its own passage through the wire, for the cooler the metal the more freely does the current pass. To illustrate this, Professor Tyndall passed a current from a forty-cell Grove's battery through a fine platinum wire, rather more than a yard long; the result was, that the wire became red-hot. He then took this red-hot wire by its two ends, with the current still passing through it, and held it so that it hung in a curve like the letter U, and he let the bottom part of the U-curve sink slowly into a glass vessel full of water. The result was, that the water quenched the redness of the wire, wherever the wire was immersed, and the current then passed more freely through the cooled portions; this, of course, increased the heating action of the current upon those portions of wire which were not immersed in the water, so that they became white hot, and, after glowing brilliantly for a time, were fused by the intense heat. The lecturer explained how some metals conduct electricity better than others. For this purpose, he joined up short lengths of platinum wire and silver wire of the same thickness, so as to form one long wire, and then he passed a powerful galvanic current through the whole arrangement; the platinum lengths then became white hot because of the resistance they offered to the passage of the electricity, but the silver lengths remained quite cold and dark, because their good conducting power permitted the current to pass freely. In this lecture he also showed how two wires, through which a current of galvanic electricity is passing, will, when free to move, visibly attract or repel each other, according to the direction of the current through each. An electrified wire will also attract or repel the electric arc produced by the passage of an electrical current between two carbon points. To illustrate this, Professor Tyndall placed a little lump of silver in a hollow on the top of the lower carbon of the electric lamp. When the upper carbon was permitted to touch the silver, the current soon made the metal boil, and when the carbons were separated a little, a brilliant arc of bright green silver vapor extended between the points. A bright image of this arc was projected upon the screen, by means of the lenses of the lamp, and when a wire, through which a galvanic current was passing, was brought near the arc, it was seen to attract it in a remarkable manner. In fact, it could be made to draw the arc of luminous vapor so far on one side as to break it, and to extinguish the light altogether. Professor Tyndall also called attention to the fact, that when frictional or galvanic electricity is passed through one wire, it will induce currents of electricity in another wire lying near, but not touching the first one. He placed one flat coil of insulated wire on the top of another flat coil of insulated wire; then, on passing the discharge from a Leyden jar through the first coil, the electrical current produced in the second one was so strong, that it set fire to gun cotton placed between the terminals of the secondary coil. In another experiment, he showed that these effects may be produced when the two coils are a considerable distance apart, and he repeated the experiment, after first separating the two coils to the distance of eight or nine inches from each other.

IN digging wells or sink-holes great care should be exercised that the drainage from the latter does not affect the former. Many wells are poisoned in this way. The water tastes unpleasantly; which is a proof that it is unhealthy. Seek out the cause—suspect that it is the sink-hole, and you will be on the right track. Many families suffer from the effects of water drawn from wells affected by sinks.

[For the Scientific American].

THE BUTTERFLY.

[By Edward C.H. Day, of the School of Mines, Columbia College].

Nothing strikes the nature-loving stranger, who chances to land here from the British Islands or the northern part of Europe, during the hight of our summer season, more than the abundance of insect life that swarms around us. The incessant shrilling of the crickets and the grasshoppers, led by the energetic cries of the katydids, drives sleep from his eyes by night, while by day, if the somewhat too monotonous and high-pitched music of the cicada as "he trills his sonorous drum," continues the offense to his ears, he is compensated by the sight of a multitude of beautiful insects, such as he seldom or never had the chance of observing in his own more temperate native land. The gorgeous butterflies that sport among our flowers, adding fresh beauties to the parterres, and giving a flickering of gay life to the oppressive stillness of the noontide heat, include, as a rule, larger and more gaily-colored kinds than are to be found in Northern Europe.

Handsome, however, as are our larger kinds they are but aberrant witnesses of the almost tropical intensity of our summers; for we are but on the verge of the conditions that favor the development of these, "the knights," as Linnæus termed them, of butterfly society. If we would see these aristocrats at home we must visit the moist regions under the equator—sojourn with Bates on the banks of the mighty Maranon or wander with Wallace amid the islands of the East. And who that has read the writings of these enthusiasts has not wished to stroll in the glades of the South American forests and see those glorious beauties of the air, that flash meteor-like above the topmost hights of the trees, scorning to descend within mortal reach? or has not felt a longing to gaze for once, if only for once, on that wondrous *Kallima paralekta*, as it sits in a bush of dead leaves, itself the most perfect imitation of a leaf in decay, "blotched, mildewed, and pierced with holes," and, more than all, apparently covered with minute fungi. Or who would not travel far to see such sights as described by Sir Emerson Tennent, as occurring in Ceylon, flights of butterflies, "apparently miles in breadth, and of such prodigious extension as to occupy hours, and even days, uninterruptedly in their passage—whence coming no one knows; whither going no one can tell. The natives have a superstitious belief that their flight is ultimately directed to Adam's Peak, and that their pilgrimage ends on reaching the sacred mountain.

"A friend of mine drove for nine miles through a cloud of white butterflies which were passing across the road by which he went." And does not the thought of the sylph, or "specter-butterfly," described by the same author, "as found only in the deep shade of the damp forest, usually frequenting the vicinity of pools of water and cascades, about which it sails, with graceful flight, heedless of the spray, the moisture of which may even be beneficial in preserving the elasticity of its thin and delicate wings, that bend and undulate in the act of flight," suggests a whole world of marvels and poetry to the genuine lover of nature? Truly the museum of the naturalist is in the field and the forest, and not in dingy, deceptive mausoleums of dried bugs and stuffed skins.

But there is no need, good reader, for us to be disheartened; we have a splendid collection around us, albeit we are a long way from "the line." The traveler who wishes to see the most must pay the heaviest fees; and if we will but read and inwardly digest the observations and reflections of such men as Darwin, Bates, and Wallace, and then go forth with an observant eye and a trifle of patience, we may see beauties and marvels enough around our own doors, without exposing ourselves to hardships and fevers, and to the thousand extra ills which flesh is heir to in the tropics. For instance, you are passing by a blighted apple-tree—a moderate-sized, orange-brown butterfly is flitting around it; it has vanished, and you are sure it did not fly away. Look closely at the aged trunk, and perchance you detect several such butterflies, the marbled underside of their wings, erected as they are at rest, so exactly resembling the varied shades of the bark, that even an observing person might pass and repass the trees without noticing these unless they take wing. These "bark-winged" butterflies, as we might well term them, are common butterflies, upon the undersides of the wings of which you will detect little metallic letters, and we think that you could scarcely find a better illustration of a protective resemblance of this particular kind, even among South American examples. Have you been reading of "polymorphism," or the fact that individuals of the same species in some cases are found differing widely from each other, though of the same sex? Our common *Papilio turnus*, or large yellow "swallow-tail," furnishes you at once with an illustration that has recently been oft quoted; and if you wish to earn a reputation for research, you have but to discover what are the peculiar conditions that influence this species, so that, north of the latitude of New York, females, yellow, similar to the males, prevail, while south of that line, black females are the rule; females, in fact so black that they resemble other species much more than their own! So you see, good reader, that you need not journey far from your own door to find illustrations of the observations of more traveled naturalists, or to enable your own thoughts to make intelligent criticism on their writings.

Your own observations, coupled with your readings, will soon bring you back to the point whence we set out. You will recognize that while the head-quarters of the Papilios and other large and strikingly-colored butterflies are in the tropics, species belonging to other families extend the range of the Lepidoptera, even into the Arctic regions. Such arctic forms occur in the United States, restricted, however, to the summits of the highest mountains, isolated there by the gradual amelioration of the climate that has advanced over these regions since the close of the glacial epoch. These forms belong to the family of the *Satyridæ*—a family that is otherwise extensively developed over the temperate regions of both the Old and the New World.

The butterflies belonging to this group are mostly of sober hues; the very name in French of the insect figured herewith indicates this fact. It is called the "Demi-deuil," or "Half-mourning" butterfly, from which the reader will safely infer that its coloration is simply black and white. Its scientific name is *Arge Galathea*. The *Satyridæ* of this region mostly haunt the shades of woods and form no exception to the general rule of sober coloration. Browns and grays of various shades only relieved by eye-like spots of brighter colors, predominate among our native species. They fly with a quick jerking flight, and when they alight the dull tints of their underwings correspond well with those of the objects amid which they rest and the shadows that surround them. The caterpillars of many species of this family feed upon grasses, as is the case with those represented before us.

THE HALF-MOURNING BUTTERFLY.

Simply adorned as these retiring butterflies are, they are not devoid of a neat beauty of their own, and doubtless there remains much of interest in their habits and associations to repay the student who may devote his attention to them.

THE fall of a large mass of rocks situated between Heidelberg and Weisloch, caused by the recent earthquakes in Germany, has revealed the works of an ancient silver mine which was worked by the Romans. Very little silver ore was left in the mines, but an abundance of rich zinc ore has been found which had remained untouched by the ancient workers.

Crime the Result of Disease.

In "Hammer and Anvil," recently published by Leypoldt and Holt, we find the following extract, which those who are giving attention to social reforms will do well to heed:

"As the only true criticism is creative, which takes the secrets of art as the starting point of its judgment, so that none but an artist can be a real critic, even so men's actions can only be judged by those to whom the old wise word applies, that nothing human is alien to them, because they have experienced in themselves and in their brethren the whole misery of humanity. But for this are necessary, as I said before, the feeling heart and the seeing eye, and an ample opportunity for training and using both.

"Who has a better opportunity for this purpose than the superintendent of a prison? He and the physician, when their views coincide and they strive together towards the same ends, alone can know what the most conscientious judge has no means of learning, how the man whom mankind have thrust out from among them for a time or forever, became what he now is; how, born thus, and of such parents, brought up in such associations, he acted thus and not otherwise at such a critical moment. Then when the superintendent, who is of necessity the confessor of the criminal, has learned his life in all its details, and the physician has discovered the defects with which he has suffered for years, when they consult upon his case, the question only is if he can be helped and how; and in the so-called prison they see, respectively, but a reformatory and an infirmary. For—and this is a point of infinite importance, which physiology will yet compel jurisprudence to acknowledge—nearly all who come here are diseased in the ordinary acceptation of the word; nearly all suffer from organic defects, and in almost every case the brain lacks the proper volume which a normal man needs for normal activity, for a life which shall not bring him into conflict with the law.

"And how could it be otherwise? Almost without exception they are children of want, of wretchedness, of moral and physical malformation, the Pariahs of Society, which in its brutal egotism sweeps by with garments gathered up for fear of defilement, or thrusts them away with cruel violence from its path. The right of wrong! Insolence of Phariseeism! A time will come when this invention of the philosophers will be placed on a level with that other of the theologians, that death is the atonement for sin, and men will thank God that at last they have awaked from the night of ignorance which gave birth to such monsters.

"That day will come, but not so soon.

"We are still deeply sunk in the mire of the Middle Ages, and no man can yet see when this flood of blood and tears will have passed away. However far the glances of a few brighter intellects may reach into the coming ages, the progress of humanity is unspeakably slow. Wherever we look abroad into our own time, we behold the unbeautiful relics of a past that we had believed to be overthrown long ago. Our systems of government, our nobility, our religious institutions, our official arrangements, the organization of our armies, the condition of the laboring classes—everywhere the scarcely hidden relation between masters and slaves; everywhere the critical choice whether we will be hammer or anvil. All our experience, all our observation seems to prove that there is no third alternative. And yet no greater misconception of the real state of the case is possible. Not hammer *or* anvil, hammer *and* anvil is the true word, for every man is both, and both at once, in every moment of his life. With the same force with which the hammer strikes the anvil, the anvil strikes the hammer; the ball is thrown off from the wall at the same angle under which it impinges upon it; the elements which the plant has appropriated in its growth, it must exactly restore in its decomposition—and so throughout all nature. But if nature unconsciously obeys this great law of action and reaction, and is thereby a cosmos and not a chaos, then should man, whose existence is subordinated to precisely the same law, acquire an intelligent knowledge of it, and endeavor intelligently to shape his life in conformity with it; and his worth increases or diminishes exactly in proportion as he does this or neglects it. For though the law remains the same, whether the man knows it or knows it not, yet for himself it is not the same. Where it is known, where the inseparableness, the unity of human interests, the inevitableness of action and reaction, are recognized, there bloom freedom, equity, justice, which are all but varying expressions for the same law. Where it is not known, and he fancies in his blindness that he can with impunity make a tool of his fellow-man, there flourish rankly slavery and tyranny, superstition and priestcraft, hatred and contempt, in all their poisonous luxuriance. What man would not naturally wish rather to be hammer than anvil, so long as he believes that the choice lies open to him? But what reasonable man will not cheerfully renounce the part of hammer, when he has

learned that the part of anvil will not and cannot be spared him, and that every blow that he gives smites also his own cheek; that the serf corrupts the master as well as the master the serf, and that in politics the guardian and the ward are rendered equally stupid."

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The Pine-Apple.

Messrs. Editors:—There is, perhaps, no production of the tropics which is so generally and deservedly esteemed by the people of the North as the pine-apple, yet of none have they such vague ideas as to its manner of growth. Not unfrequently have we heard it expressed as being the fruit of a tree; associating it with the cone-bearing trees of our own country. The pine-apple plant (*Ananassa sativa*) is a native of tropical America, growing wild in the forests, but is also largely cultivated in those regions, as well as to some considerable extent in the West Indies, and on the eastern continent.

It has fifteen or more long, serrated, ridged, sharp-pointed leaves springing from the root, resembling in its general aspect the century plant, but much smaller in size. In the center of this cluster of thick, succulent leaves, springs up a short stalk bearing a spike of beautiful flowers, which in time produces a single pine-apple. On the summit of the fruit is a tuft of small leaves, capable of becoming a new plant, which, together with suckers, are the means by which it is propagated, as the cultivated plant seldom produces seeds. It flourishes best in a moist and warm climate, but is able to survive a long drought and extreme heat.

There are several varieties of the pine-apple, differing in their leaves being more or less spiny on their edges, and in the shape and color of the fruit. Great care is requisite in its cultivation, otherwise it will be coarse and fibrous, with but little sweetness. Nothing can surpass the rich and delicate flavor of a pine-apple which has been properly grown, or of the wild fruit of the forest, which we always found equal, if not superior to the cultivated ones.

A word as to the manner of preparing a pine-apple for eating may not be out of place here. Let the rough exterior first be removed to a sufficient depth, and then slice the fruit longitudinally with the core, and not across the hard center, as is generally done with us. As soon should an ear of green corn be divided in sections when the kernels must be pulled from the cob, as a pine-apple across the core, instead of nicely slicing the fruit from its adherents. The deliciousness of a pine-apple when freshly picked from the plant and prepared in the above manner cannot be surpassed.

H. M. Myers.

Orbital Motion.

Messrs. Editors:—I have devised a simple addition to the gyroscope, to serve as a popular proof and illustration of the demonstrable truth, that axial motion produces orbital motion. Dr. G. M. Ramsay says (Cosmos p. 78) "the Gyroscope demonstrates that axial, tangental force becomes an orbital propelling power, but it carries the gyroscope in a reverse orbital direction;" and hence he draws the conclusion, that "if the planets had an independent, direct axial force, they would move in a retrograde orbit."

I maintain that the gyroscope itself will show his conclusion incorrect. Set it to spinning with a direct motion, and observe it when the axis deviates a little from a perpendicular. The hub describes an orbit with a direct motion, the same as the wheel moves. The inclination of the axis represents the inclination of a planet's axis to the plane of its orbit; and also the nutation of the earth's axis. And even when the axis becomes horizontal, the under side of the wheel is, in fact, the outer side of the orbit, and its orbital motion is direct, the same as before.

Thus planetary, axial, and orbital motions are well represented by the gyroscope; but more truly and plainly by my addition, which any person can readily make or get made. It consists of a metallic bar (1 foot long and $\frac{1}{16}$ inch in diameter for the small gyroscope), bent about 30° in the center, a cavity on the concave side, so as to balance on a pivot like a compass needle; a socket on one end, a weight on the other, to balance the gyroscope. Set it to spinning in this socket, and it at once produces an orbital motion around the pivot, direct or retrograde, just as you spin the gyroscope.

That this must be so appears as certain and plain as Archimedes' "Eureka." The radius vector of a planet may be regarded as a lever. The direct axial tangental force at the outer end of the planet's diameter, which coincides with the radius vector, is just equal to the tangental force at the inner end of the same, where the motion is retrograde to the orbit; but the outer tangental force having the longest leverage, the motion must be direct.

S. N. Manning.

Kankakee, Ill.

How to Make a Perfect Boiler.

Messrs. Editors:—To make a perfect boiler the following rules should be observed: First, the iron in each cylinder should be of uniform thickness and of good quality, and a templet made corresponding with the thickness of iron and size of boiler. Each plate should be marked off with a marking punch from this templet. (I do not approve of using a pencil or white lead for marking). There should be a center on the press punch to enter the mark indicated by the marking punch. This will make every hole in the boiler so perfect that a reamer will not be required. Secondly, the rings should be so laid out that by driving a pin in each of the lap holes both rings will be closely hugged together. To make good holes the punches should be largest at the end, and tapering back, with the face a little concave, so that the edges touch the plate first. When the punch becomes dull throw it in the scrap heap; it will not pay to repair or reharden it. Thirdly, all flat surfaces of boilers should be braced to sustain a pressure equal to the bursting pressure of the cylinder; the braces being in all cases straight, so as to take a direct and positive strain, fitted of the exact bevels of the plates and riveted when possible, never using pins, as they are liable to work loose; for in my opinion, this evil has caused the destruction of many boilers. Use the *best American iron*; thanks to protection, we can now produce an article equal to the best in the world. The edges of plates should be planed, not chipped, and the riveting and caulking done by experienced workmen. For working pressure Haswell's rule should be the guide, as it is more accurate than any I have ever seen. The boiler should be in charge of a *sober*, intelligent, industrious man; then there will be no fear of explosion.

As bituminous coal is now much used; would it not be economy, to say nothing of the abatement of a great nuisance, to consume the smoke? I think also that if the water was sufficiently heated to disengage impurities, and injected into a receiver, beneath the fire box, it would be attended with benefit; there would be little or no commotion, and the water would then flow into the proper channel, and leave impurities where a blow pipe would carry them off. I think both these results can be effected; let me have your opinion upon the subject.

Patrick Quinn.

South Newmarket, N. H.

Mental Science.

Messrs. Editors:—There are periods of crime, as illustrated by the homicidal epidemic prevailing throughout the country. There are also tendencies to mental and moral insanity in various degrees, from ungovernable temper to mania, and the question arises, "Should these particular tendencies absolve from responsibility either at the bar of conscience, or in the verdict of the jury?"

If such tendency be the result of indulged selfishness or intemperance of any kind, the acquittal places a premium on criminality, and the next step may be as in the East, to consider the insane not only deserving of sympathy, but under the special protection of the Almighty.

While we predict the eclipse and the revolutions of Saturn, we unfortunately know little of the wondrous system within us, and our educators would vindicate their noble profession by teaching the pupil the science of self-knowledge, to ascertain the recurring laws of emotion, controllable to a certain point, and regular (to the thoughtful) as the cycle of the seasons. Said a recent victim, "My paroxysm is coming; be careful at such an hour." Would it be impracticable to extend this idea to self-application; to watch the recurrence of internal tendencies carefully as external occasions; to realize that injury to ourselves or others from uncontrollable passion (alias insanity) comes in most cases from long continued criminal negligence, and cannot, therefore, escape the penalties of responsibility?

G. A. Leakin.

Baltimore, Md.

A Question for Watchmakers.

Messrs. Editors:—I would be very glad to see through your excellent journal what argument pocket chronometer makers use when it is stated to them that the balance in the chronometer escapement has an unlimited motion, and in the pocket, winding, or careless handling, a valuable hair-spring may be subject to more tension than it ought to have.

I never could account for this oversight, and always wondered how it is looked at from a watchmaker's standpoint, who not unfrequently has much trouble before he can get the spring to work to his notion; and, there are springs in use in high priced pocket chronometers that could not be bought at half the price a whole movement costs, while a mere accident may destroy them.

In this matter the lever principle has the advantage over the chronometer escapement, as every one can see. Now, I do not want to find fault with the chronometer, I only want to point out the cause of hair-spring breaking, and a necessity for its prevention in expensive watches.

J. Muma.

Hanover, Pa.

Information Wanted About Brick Making.

Messrs. Editors:—I desire to learn all the improvements in brick manufacture. I manufacture bricks in this city. I use the Vervalen & Wiley machines. The main difficulty is that in this part of the South we have so much rain, during the summer months, that it prevents the bricks from drying. I understand there exists some artificial invention to dry them as it would to dry vegetables and fruits. I have an idea that it is similar to a bakers' oven. I would like to know at once, without experimenting, as I have no time to lose; and also to learn how to make the concave bricks for roofs, and fire-bricks. I wish to obtain the pamphlets of all brick manufacturers that exist at the present day. I will pay for the pamphlets, and also for the tunnel or anything else that can answer for that purpose.

Joseph Borro.

Savannah, Ga.

Dr. Stölzel gives what he considers an excellent, cheap, and durable substitute for the copper cylinder in Daniell's battery. A piece of well-polished sheet tin is immersed in a very dilute solution of a copper salt and put in connection with a weak galvanic current. After the lapse of from fifteen to eighteen hours a layer of firmly-adhering copper is deposited upon the plate, which may now be bent into the required form.

The White Man's Feet.

Edward E. Cheever, in the May number of *The Naturalist*, gives a most interesting paper on the "Indians of California," in which we find the following passage: "In tracking white men, they (the Indians) cannot make mistakes. The white man's foot is deformed, made so by the shape of his boots and shoes, and even when barefooted, his toes are turned inward. The Indian's foot, never having been compressed, has the toes naturally formed and straight as our fingers are, and he can even use them to hold arrows when he is making them. When he walks, therefore, each toe leaves its imprint in the dust or sand, the imprint of the little toe being as straight, perfect, and distinct as the largest."

This paragraph might be made the text for an article, and perhaps Mr. Brigham will make it one before he concludes his present series of valuable papers. We wish we knew of some plausible reason, why Indians deserve better formed feet than white people, but we do not. No doubt it is a matter of accident, rather than of choice, but so it is. And surely, the white race, with all their glorious achievements in the sciences and the arts, might easily construct boots and shoes on such models as would allow nature full play; and we believe they would if they had a proper understanding of the subject, and a higher ideal of what a glorious state physical perfection is, and the degradation of deformity. The foot is not so degraded a member of the body that we should neglect it, and it cannot grow into perfect form if pinched and cramped by bad shoes, and the sooner people know it the better. It is no excuse that it is kept so much out of sight,

for the true artist recognizes deformity, even though covered by finery and leather.

Will not our mothers who have the care of children look into this subject, and if they have been in error before, at once apply the true remedy?

ADULTERATION OF PAINTS.

BY PROFESSOR HENRY E. COLTON.

It has been said that this is an age of adulteration. This may or may not be true. When prices are high those articles whose nature permits the frauds, will be adulterated, but there is a point in the decrease of prices where adulteration cannot be done with profit, taking into view, first, the cost of the article of adulteration; second, the deterioration in the article adulterated; third, the at least constructive damage to the adulterator if detected.

Almost the only adulteration of paints is sulphate of baryta, commonly called barytes. The oxide of zinc is frequently put into white lead, but it is questionable whether it is not an improvement rather than an injury. The commercial article, "barytes," is a sulphate of the alkali baryta, which has as a base the metal barium. It is insoluble in water and the weak acids, and but sparingly soluble in the most concentrated acids. Its specific gravity is about 4·84, being the heaviest known mineral, hence its common name among miners is heavy spar.

It is chiefly produced in the State that gave us the wooden nutmegs, and goes by the cant name of "Connecticut Lead." It is abundant in Virginia, North Carolina, Missouri, Georgia, and New Jersey. The best article now produced comes from Missouri. It usually accompanies lead ore; varies in color from a milky to a clear white, and can easily be told by its great weight and crystalline structure. Its value depends upon its freedom from specks of iron, copper, or lead ore.

To prepare it for market the ore is cracked into pieces, about the size of buck shot. These are then agitated in dilute sulphuric acid to dissolve the copper and iron, then washed with water, again treated with acid, then washed repeatedly with water, dried, and ground perfectly fine. After which it passes through a number of bolting cloths, and is ready for market. Lead specks are more difficult of extraction. If not very numerous no effort is made to take them out, but if desirable to do so, the cracked ore is treated with strong hydrochloric acid, and sometimes with lime. Some manufacturers do what is called "floating," that is, after grinding the rock to flour dust it is run through a series of vats, water passing through them and constant agitation being carried on. The lighter impurities pass off, and nearly perfectly pure sulphate of baryta precipitates. The impurities of the ore other than above mentioned, are silica, carbonate of lime, and sometimes a little sulphate of strontia. The article differs very much in color and fineness as put on the market; that from St. Louis has, just now, the highest reputation, it is in fact less crystalline in structure than any other—partaking somewhat of the fibrous nature of strontia.

The present product is about 20,000 tuns per annum, but it is estimated that in 1865-6 fully 40,000 tuns were imported into and produced in the United States. At that time the price per tun ran as high as $90, now it is $35 and $40. The imported article comes from Nova Scotia, Germany, and England. The profits of its production and manufacture have been very large; but it is doubtful if it can be produced with profit for much less than $30 per tun.

We have been thus explicit with this article because of its whole product fully four-fifths enter into the adulteration of paints. Its other uses are for the adulteration of other articles, even medicines. We believe its only good use is as a substitute for white lead in enameling paper collars. As an adulteration of paints it adds to the weight and injures the quality. The paints containing it are better than whitewash just in the proportion that they have a larger percentage of lead or zinc in them. Some are the merest shams, others have 75 and 80 per cent of lead and zinc, and are proportionably valuable. Some of the latter have attained great reputation, especially when ground in a peculiarly refined oil, which contains some of the acids used in its refining. No person need be fooled by an adulterated paint. If he buys it, it is simply his own fault. If he desires cheapness more than durability and purity, he gets it. Every one knows when he buys a coat below the cost of the wool in it, and the labor on it, that he is getting shoddy. Metal lead, for instance, is 8 cents per pound (gold); white lead then would likely be about 12 cents per pound (currency) ground in oil. Hence, if a man buys a paint at 8 cents, he should have sense enough to know he does not get a pure white lead. It is further the custom of manufacturers never to put their names with the words "Warranted Pure," on adulterated brands. The latter or the former may be on, but never both together. Besides, no respectable firm ever sells a customer an adulterated paint if he asks for the pure and is willing to pay its price.

HOW CAN THE ADULTERATION BE DETECTED.

In a late statement of how to analyze white lead in oil, published in the SCIENTIFIC AMERICAN, it was recommended to dissolve out the oil with spirits of turpentine. This is next to an impossibility, as that article is not sufficiently volatile, has itself somewhat of an oily nature, and some of the particles of the pigment will remain coated with oil and not dissolve in the after process, hence creating an idea of impurity when the paint may be actually pure. Our experience has been large, and we prefer bisulphide of carbon to all other solvents of oil. It evaporates freely, takes less of it to do the work, and leaves the pigment cleaner; nearly as good is high gravity gasoline, say 80°. It is our custom to agitate the paint in the liquid, allow it to settle and draw off. Place the pigment on a funnel, filter, and triturate again and again with the solvent. Then dry the pigment on a sand bath, wash with water and re-dry. Any one can easily tell from its looks and feel if he has extracted all the oil. Perfect dryness and perfect freedom from oil is absolutely necessary. Dissolve the dry pigment thus obtained in dilute nitric acid. Strong nitric acid will not dissolve white lead, it must be diluted with four or five times its volume in water, perhaps more. The operation is accompanied with the evolution of carbonic acid gas. If all is dissolved it is pure lead or zinc—either oxides or carbonates. If there is residuum after repeated trials, with more or less dilute acid, it shows presence of an adulteration—most likely barytes, perhaps sulphate of lead. Take this and boil in hydrochloric acid, if it dissolves it is not barytes. If dissolved, pour into the solution a little hydro-sulphuret of ammonium, a black precipitate shows that you have sulphate of lead. If there is no precipitate, put in a little dissolved oxalic acid; a white precipitate shows lime. The sulphate of lead is seldom or never used as an adulterant in this country, the sulphate of lime never in paint. For zinc, pour into the nitric acid solution sulphuric acid, the lead will precipitate as sulphate; then into the liquid pour a little hydro-sulphuret of ammonium, a white precipitate will show zinc. There is, however, in the market a pigment containing a sulphate of lead, not crystalline in structure, and perfectly soluble in dilute acids. It is made by sublimation.

Whiting and terra alba are seldom or never used as an adulterant for any white paint. They are two light and turn dark in oil. Some colors, however, have terra alba as a base. The process indicated, if conducted with care, will give a perfect result. The main point is to get the oil out entirely; and with all due respect we assure our friends of the SCIENTIFIC AMERICAN that it cannot be done with spirits of turpentine.

There is just now coming into practice another species of adulteration which for worthlessness bids fair to eclipse the baryta paints. This is the use of water instead of the full quantity of oil or spirits of turpentine. A paint is valuable and durable just as it has the proper quantity of pure oil in it. This new adulteration is thus accomplished: The soluble salts of the metals and alkalies dissolved in water and mixed with oil form a sort of soap, add to this a pigment and it will mix and be held in solution. Small quantities of spirits of turpentine or benzine are added. To such an extent can this be carried that in some of the paint sold "Mixed ready for use," fully one-half is water. Their worthlessness for work exposed to the weather is evident. There are paints thus sold, however, which are properly mixed.

[Notwithstanding our correspondent's criticism, we insist that very good results may be obtained by proceeding as we directed in the article to which he refers. He seems to have overlooked the subsequent washing with alcohol, after the spirits of turpentine have been used to remove the bulk of the oil. Alcohol dissolves both linseed oil and turpentine, and by its use the solid substances contained in the mixture may be rendered sufficiently clear for subsequent treatment, if the oil is pure linseed, as we can vouch from experience. If the linseed oil used is adulterated with fish oil, rape-seed or cotton-seed oil, other solvents must of course be used. In that case ether or the solvents he names are better. The bisulphide of carbon, or ether, is not, however, available to painters generally. Benzine and gasoline are, however, good solvents, and may be advantageously substituted for the turpentine. Turpentine and alcohol are, however, to be found in all painters' shops. If the alcohol be heated to boiling, it will be more effective than when used cold, and less will be required. —EDS.

SIRUPS FOR SODA WATER.

SIMPLE SIRUP.—Take of white sugar, 14 lbs. (com.); water, 1 gal. Dissolve with the aid of a gentle heat, strain, and when cold add the whites of two eggs, previously rubbed with a portion of the sirup, and mix thoroughly by agitation. (The egg albumen is added to produce froth).

LEMON SIRUP.—Take of oil of lemon, 25 drops; citric acid, 10 drachms; simple sirup, 1 gal. Rub the oil of lemon with the acid, add a small portion of sirup, and mix.

ORANGE SIRUP.—Take of oil of orange, 30 drops; tartaric acid, 4 drachms; simple sirup, 1 gal. Mix as above.

VANILLA SIRUP.—Take of fld. ext. vanilla, 1 ounce; citric acid ½ ounce; simple sirup, 1 gal. Rub the acid with a portion of sirup, add ext. vanilla, and mix.

GINGER SIRUP.—Take of tinc. ginger, 4 ounces; white sugar, 7 pounds (com.); water, ½ gal. Heat the sugar and water until the sugar is dissolved, raise to the boiling point, then gradually add the tinct. ginger, stirring briskly after each addition.

SIRUP SARSAPARILLA.—Take of simple sirup, 1 gal.; comp. syr. sarsap. *ad lib.*; powd. ext. licorice, 1 ounce; oil sassafras, oil wintergreen, aa, 15 drops; oil anise, 10 drops. Rub the oils with powdered licorice, add a portion of sirup, rub smoothly, and mix the whole together by agitation.

ORGEAT SIRUP.—Take of cream sirup, ½ pint; vanilla sirup, 1 pint; simple sirup, ½ pint; oil bitter almonds, 5 drops. Mix.

COFFEE SIRUP.—Take of ground, roasted coffee, 4 ounces; boiling water, 2 pints; sugar, 4 pounds (com.). Infuse the coffee in the water until cold, strain, add the sugar, and make a sirup.

STRAWBERRY SIRUP.—Take of fresh, ripe strawberries, 10 quarts; white sugar, 24 lbs.; water, ½ gal. Spread a portion of the sugar over the fruit, in layers, let it stand four or five hours, express the juice, strain, washing out the marc with water; add remainder of sugar and water, raise to the boiling point, and strain.

SIRUP OF RASPBERRY.—Proceed as for strawberry sirup.

PINE-APPLE SIRUP.—Take of ripe pine-apples, No. 2 or 3; white sugar 16 lbs. water, q. s. Cut the fruit in thin slices, spread sugar over them, let stand 12 hours. Pour off juice and sugar, and set aside. Express the fruit, adding a little water. Then take water, q. s., to make, with the above liquid (juice and sugar), 1 gal. Form a sirup with the sugar and water, and boil the pieces of the fruit already expressed. When the sirup is nearly completed add the fluid and boil a few minutes, to clarify. Remove scum, and strain. These three fruit sirups should be bottled when warm, corked tightly, and when wanted for use add equal parts of the fruit sirup and simple sirup. They will keep a year without change.

NECTAR SIRUP.—Take of vanilla sirup, 5 pints; pine-apple sirup, 1 pint; strawberry or raspberry, 2 pints. Mix.

CREAM SIRUP.—Take of fresh cream, ½ pint; fresh milk, ½ pint; powdered sugar, 1 lb. Mix by shaking. Keep in a cool place. The addition of one half drachm bicarb. soda to this sirup will prevent rapid change.

Editorial Summary.

MIGRATION OF FABLES.—Professor Max Müller, LL.D., recently lectured at the Royal Institution on "The Migration of Fables." He narrated how the proverb, "Do not count your chickens before they are hatched" is founded on a fable, and he traced this fable back through many of the literatures of Europe and Asia, and through some of the ancient books of Persia, to the "Panka Tantra," an ancient Sanscrit book, rich in fables. In the course of this lecture, he told how "St. John of Damascus" was in reality an individual who held high office at the court of the Khalif Almansur. He also told how Buddha in the course of time became transformed into St. Josephat, and under that name was made a saint in the Romish Church. This announcement was recived with much laughter by the listeners, but Professor Müller added that, it Buddha actually lived the kind of life he is narrated to have done, no man ever better deserved to be made a saint by his fellow creatures.

ICICLES IN THE CELLS OF PLANTS.—At a meeting of the Academy of Sciences of Paris, on 21st February, M. Prillieux sent in an interesting paper on the congelation of plants. He has established the existence normally of large icicles in the interior of all frozen plants. These icicles form small columns, perpendicular to the surface, and often penetrating the epidermis. The ice is formed from liquids derived from the cells. The cells themselves remain intact, so that there is no destruction, but simply a separation of organs, and therefore what has been said concerning the death of plants by freezing goes for nothing.

So enormous are the losses of the Austrian Government from the frauds of the stamp washers, who collect old stamps and clean and sell them for new, that the Government finds it economy to furnish stamped envelopes free to the public except the usual postage duty.

In this country the envelope makers, who are anxious to raise the prices of envelopes, are whining for protection, and they want the Government to stop the sale of stamped envelopes. But if any change is to be made the people will prefer the Austrian plan.

A NEW PHOTOMETER.—A photometer, invented by M. Nagant, is based upon the formation of a column of liquid, partially opaque, which may be drawn out until the length is such that the light from an illuminating body ceases to be visible through the liquid. The length of the column, which completely obscures the light, starting from the point where the column is thinnest, gives a measure of the intensity of the light under examination.

THE following results from an extended series of experiments by W. Casselman, in order to determine the effect of boiling saline and other solutions upon glass and porcelain vessels, may be found useful: Water and acids hardly, if at all, act upon good porcelain vessels; the fixed alkalies attack porcelain, but less than they do glass, which is far more readily acted upon by the substances alluded to as well as by saline solutions.

CHINA appears to be overcoming the peculiar superstition which for ages has prevented the development of her vast mineral wealth. Permission has been given to open up the coal miles at Nanking and Kinthaing where coal of a superior quality is obtainable. Good specimens of coal have also been found at San-ti, some two hundred miles above Hankow.

PERFUMED CARBOLIC ACID.—It is said an article of this kind has been recently introduced in England, used for the handkerchief and as a dentifrice, for which latter purpose it is said to be excellent, as it prevents decay from its antiseptic qualities. This is a hint from which American perfumers may perhaps profit.

GEORGIA STATE FAIR.—The premium list of the State Agricultural Society of Georgia has been sent us. The Society will hold its Fair at Atlanta, beginning on Wednesday, October 19th, and closing on the 26th. The Assistant Secretary is Mr. Thomas C. Howard, of Atlanta, who may be addressed by parties interested.

EXIT MACFIE.—The *Mechanics' Magazine* says that Mr. Macfie's book on the "Abolition of Patents" can be had at 1s. each, that gentleman having so many on hand he is desirous of disposing of them at a nominal price. They were originally published at 5s.

THE DARIEN EXPEDITION.—It is announced that the exploration of the routes for the proposed Darien Canal, known as the Caledonia and San Blas, have been found impracticable for such a work, and that the survey has been abandoned, at least for the present season

Improved Planer for Blind Slats.

Our engraving is an illustration of a very compact, well-constructed, and effective machine for planing the slats of window-blinds, which possesses several advantages of sufficient importance to merit the attention of manufacturers.

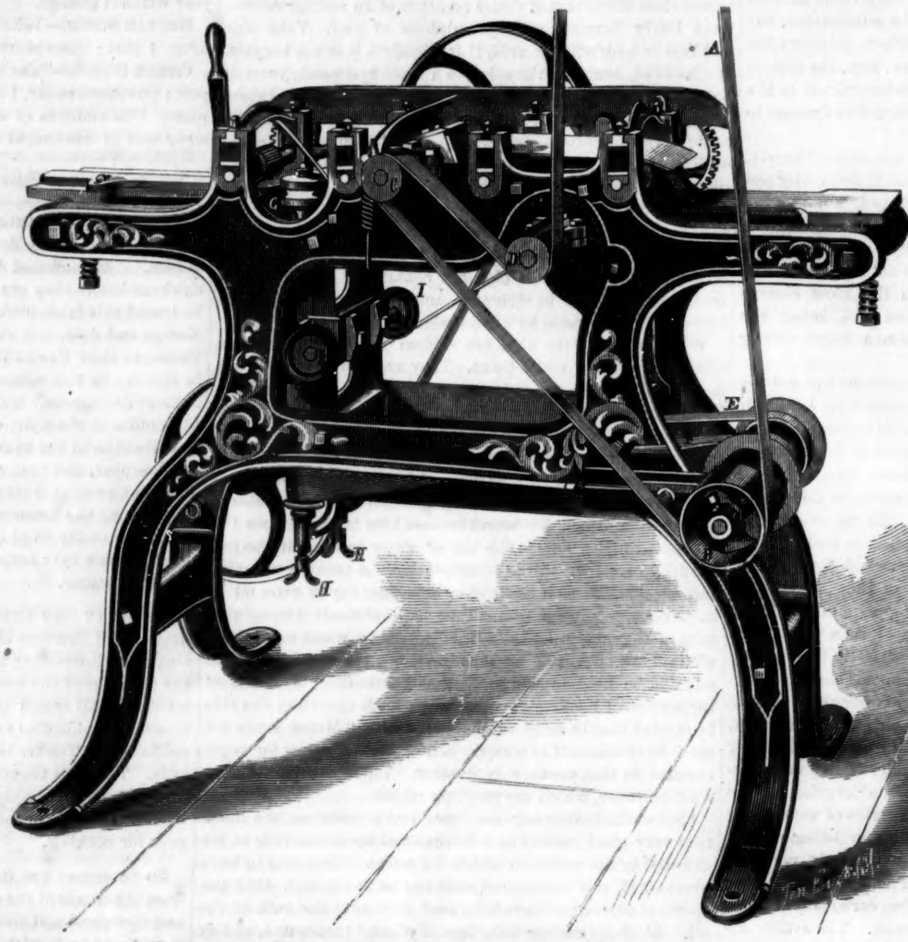
A is the main belt which, passing over the pulley, B, also passes over and drives the pulleys, C and D, on the upper and under cutter-head shafts. The pulley, B, drives a shaft with pulleys from which the belts, E and F, pass to the pulleys on the vertical arbors of the side-cutter heads, G. The special advantages obtained in the machine are the result of the perfect adjustability of all the parts to varying thicknesses and widths of the slats to be planed.

The edge-cutters, G, are adjustable both vertically and laterally; vertically by means of the thumb screws, H, and laterally by screws impelled by the hand wheels, I. The screws, H, raise the frame which carries the side cutters, G, so that these cutters move up and down together. Each of the hand wheels, I, works an independent screw shaft which moves the entire cutter-head arbor next it laterally and parallel to the other.

The hight of the table is adjusted by thumb-screws under the table, not shown in the engraving, but perfectly convenient of access. The under cutter-head maintains its relative position to the table during the adjustment. The frame which carries the under cutter-head can be removed for sharpening the cutters, and replaced by turning a single screw.

All the necessary adjustments can be made while the machine is running, which is a great convenience over other machines for the same purpose. The right hand edge-cutter being once adjusted to the gages, the width of slat is then governed by setting the left hand cutter out or in. The workmanship on this machine is of superior quality and will please the taste of those who admire good work, and the claims of the inventor as to its advantages will be found to be entirely within bounds.

Address for rights or machines, C. P. S. Wardwell, patentee and manufacturer, Lake Village, N. H.



WARDWELL'S IMPROVED BLIND-SLAT PLANER.

Improvement in Manufacturing Counters for Boots and Shoes.

We regard this invention, simple as it is, as one of great merit. By its use a given amount of leather will cut twenty-five per cent more counters than in the old style of cutting. Twenty-five per cent of the cost of all the leather used for this purpose in the United States, in a single year, is a fortune in itself, as any one may convince himself by a simple calculation.

The old method of cutting these counters is represented in Fig. 1; the leather being cut square and afterwards scarfed off with the knife; the portions thus scarfed off being wasted; or, if afterwards utilized in some of the ways in which leather cuttings are worked up, their value is small compared with the first cost of the leather.

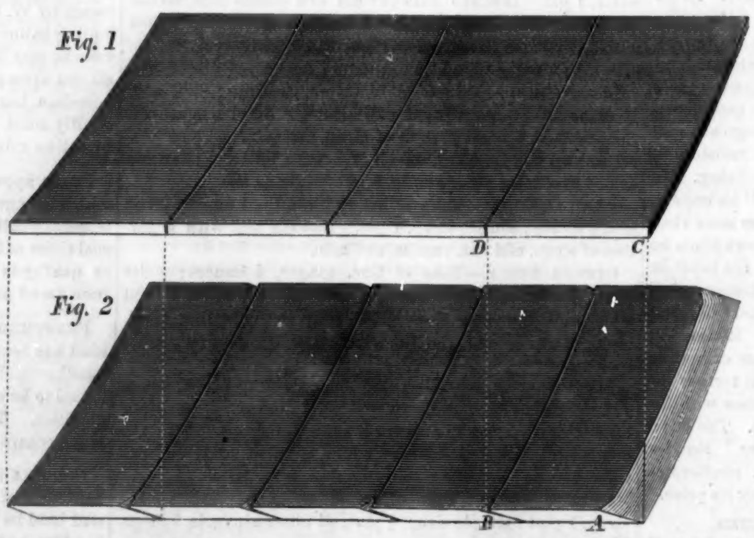
Fig. 2 represents the new method by which the counters are uniformly cut and scarfed off in a single operation; and, as will be seen in a comparison of the two methods, a gain of one counter in every four cut by the old method is accomplished.

The cutting instead of being done vertically to the surface of the leather, is done obliquely to it, as shown; thereby scarfing off an edge of two counters at once, and only requiring a width of leather of the full thickness shown between A and B, Fig. 2, whereas in the old method a proportional width, as shown between C and D, Fig. 1, was required.

In this cutting the proper curvature is given to the counter, and it is ready for use without further preparation.

Fig. 1

Fig. 2



PHINNEY'S NEW MODE OF CUTTING BOOT COUNTERS.

This invention was patented, through the Scientific American Patent Agency, February 9, 1869, by S. C. Phinney, assignor to himself and John G. Phinney, Stoughton, Massachusetts. Address S. C. & J. G. Phinney, as above.

Moving a Wind-Mill Sixteen Miles.

A novel experiment, not quite so sensational as the moving of an hotel at Chicago, but yet something quite out of the ordinary way, has been the removal of a wind flour-mill, with all its fittings, from Westacre to Clenchwarton, Norfolk, England, a distance of about sixteen miles. The mill was a wooden structure, standing upon wheels. Having been purchased by a man living at Clenchwarton, he determined to endeavor to draw it along the road by a traction engine, but all efforts to find one strong enough proved ineffectual; the application, however, of a powerful steam cultivation engine proved more successful. In passing along the route various expedients had to be tried, such as in ascending a hill the engine proceeded to the summit, and then pulled the mill up with a chain, and so carefully had the task to be performed, that it occupied three days to make the journey. In crossing the Great Eastern Railway at Walton the telegraph wires were broken. In attempting to cross the Ouse it was feared the celebrated long bridge would not be strong enough to bear the enormous weight, but the engine having first passed over, the mill itself was drawn over, the timbers of the bridge in the meantime creaking, and showing that a severe test was being put upon it.

Machines Wanted at the South.

We are almost daily in receipt of letters from Southern subscribers asking us to recommend the best machines in almost all departments of the arts. We now have on our table letters inquiring for machines to turn and mortise hubs, spokes, etc.; machines to bend fellies; scroll saws; cutting chair bottoms; turning bedposts; machines for separating grass-seed from rice, etc. Advertisers would do well to avail themselves of our large Southern circulation to place this information before those who wish to purchase.

HONORS TO WORKMEN IN FRANCE.—The Emperor of the French having nominated one of the leading pianoforte makers a Chevalier of the Legion of Honor, the workmen of the principal manufactories have sent a deputation to the Minister of Fine Arts to thank him and the Emperor for the honor thus conferred upon one of their members.

Supplying Water to Railway Trains.

Some time since we illustrated and described an English apparatus for supplying water to locomotives while in motion. The plan has now been introduced into this country, and has been experimented upon the Hudson River Railroad with success. At Montrose Station, near Peekskill, there was constructed in the center of the track a trough, 1,200 feet in length, fifteen inches in depth, and eighteen inches wide. This was lined with sheet-iron, heavily painted. The trough is perfectly straight, will hold 16,000 gallons of water, and is fed by a couple of springs to the north and east of it.

About the same time that the construction of the trough was commenced, locomotive No. 43 was taken to the repair-shop. Here, in a quiet manner, skillful workmen in a short time fitted her out with ingeniously constructed machinery, connected with her tender, to draw the water from the trough. From the man-hole in the tender, down through the latter to a position inside of the hind trucks, runs an ingeniously-formed pipe. The pipe curls as it leaves the man-hole, and after forming a half-circle, is fitted with a nozzle at its end, which always points the way the engine is going. An iron bar is fastened to the nozzle, which connects with another bar from a point near the fireman's box. When the locomotive approaches the trough, the nozzle can be dropped instantaneously into the water, while the train is running thirty miles an hour. The nozzle sinks only to the depth of two inches into the trough, yet when the 1,200 feet are passed over, 1,634 gallons of water will have been drawn into the tender.

The first experiments in taking water by this new method were made a few days ago. The locomotive dashed over the rails at the rate of thirty-five miles an hour. As the nozzle struck the water the fluid rushed into the tender with the roar of a young Niagara, and when the trough was left behind, the tender was full. The experiment was a great success, and gave complete satisfaction to the officers of the Hudson River Railroad Company.

It is next proposed to locate a trough between Hudson and Catskill, and at points on the Central and Western connections, so that in time trains may be run through from New York to Chicago in twenty-four or twenty-six hours.

Chinese Gold-Lacker.

The gold-lacker lining of a Chinese cabinet in the Museum at Cassel pealed off, and thus gave Dr. Wiederhold the opportunity of studying the composition of this substance. On examining it he found particles of tin foil attached to the lacker, so he comes to the conclusion that this material formed the ground upon which the lacker varnish was laid. His attempts to imitate the varnish were perfectly successful, and he gives the following directions for the preparation of a composition which closely resembles the true Chinese article. First of all, two parts of copal and one of shellac are to be melted together to form a perfectly fluid mixture, then two parts of good boiled oil, made hot, are to be added; the vessel is then to be removed from the fire, and ten parts of oil of turpentine are to be gradually added. To give color, the addition is made of solution in turpentine of gum gutta for yellow, and dragon's blood for red. These are to be mixed in sufficient quantity to give the shade desired.

Polytechnic College of Pa. Commencement.

The Polytechnic College of Pa. held its seventeenth annual commencement June 29, at the Academy of Music, in Philadelphia. A large and brilliant audience was present. The Germania Orchestra supplied the music. Hon. John P. Verres, in the absence of Governor Geary, presided. Rev. Dr. Davidson, formerly president of Transylvania University, Kentucky, opened the exercises with prayer. Addresses were delivered by Samuel C. Perkins, Esq., and Dr. A. L. Kennedy, president of the faculty. We are glad to learn that this institution is in a flourishing condition, and is doing a good work in the cause of technical education in this country.

PLANTS are the accumulators of the power which man and animals distribute and disperse.—*Piesse.*

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

"The American News Company," Agents, 121 Nassau street, New York.
"The New York News Company," 8 Spruce street.

VOL. XXIII., No. 2. . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, JULY 9, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

THE PROGRESS OF CHEMISTRY IN 1870.

Although there have been no startling discoveries since the 1st of January, 1870, still chemistry has held even pace with all other sciences; and we have been called upon from time to time to record numerous improvements in the methods of manufacture of various articles, and in the new application of well-known compounds.

The uses of oxygen gas have been greatly extended since its cheap manufacture, and we hear of it as an important remedy in disease, as a powerful agent in the production of great heat, as a source of light, and it can now be purchased the same as any common agent employed by chemists.

The recent improvment in the preparation of hydrogen bids fair to become an important step in the manufacture of illuminating gas, as it can be converted into carbureted hydrogen very cheaply, when it will burn with a highly illuminating flame, thus affording a cheaper and purer light than has hitherto been known. The simultaneous discovery of the cheap and ready preparation of oxygen and hydrogen opens the way to many uses of those gases hitherto considered impossible on account of the expense attending their manufacture; and the study and development of this new industry must be assigned to the first half of this year. Hitherto, in speaking of hydrogen, we have been in the habit of assigning very few uses to it. That it would lift balloons on account of its levity has long been known, but its application in medicine is a novelty of which, now that we are likely to have the gas in any quantity, we shall probably hear much more. When breathed in large quantities it proves fatal, but in proper proportions it acts as an hypnotic, and we may hear of it hereafter as a rival to the hydrate of chloral in cases of sleeplessness.

Further uses of hydrogen in conjunction with oxygen for the fusion of the most refractory metals is no novelty, and has long been anticipated as a probable and desirable consummation. The practical application of the condensation of gases for the production of cold is a result that has been attained this year more than in any other former period. The fact of the possible compression of gases into liquids was long ago ascertained by Faraday, and feeble attempts were made a few years since to apply it for the production of cold, but it was not until recently that these experiments proved successful. There now appears to be no doubt that the liquefaction of gases is the true method upon which to found the artificial production of ice on a commercial scale; and we shall be glad to record the success of any mechanical contrivance that shall accomplish all that science pronounces as entirely practicable in this direction. The chemistry of the question has been fully worked out, and what remains to be done is a similar solution of the mechanical part of the problem.

During the present year we have recorded unusual progress in the art of photography, especially in the rapidity of printing, and the permanency of the pictures. The Albertype offers a method by which a thousand prints can be taken in a day, with durable ink, and in colors according to the natural appearance of the objects, where those colors are such that they can be introduced with the ink. The Albertype and the Woodburytype are among the most important improvements of the present day, and offer encouragement that a rapid method for the production of photographic prints has now been attained. Photographing natural colors has made very little progress during the last six months, and it appears doubtful if we shall ever be able to accomplish this desirable result.

In the manufacture of glass we have to mention the use of salts of baryta, of fluor spar, of salts of thallium, for optical purposes, and in general a very satisfactory progress.

Platinized mirrors have been introduced, and appear to give satisfaction for various purposes; but the manufacture has hardly reached such proportions as to enable us to pronounce with absolute certainty upon the success of the method. Silver mirrors, which at one time were urgently pushed as a cheap and most desirable invention, have by no means displaced the quicksilver mirror so long in vogue; and there would appear to be some practical difficulties in the way of the universal substitution of silver for mercury. From a sanitary point of view it is a misfortune that silver cannot take the place of mercury, as the latter is exceedingly poisonous to the workmen; and it was chiefly from this humanitarian consideration that Liebig took up the investigation and devised cheap and ready methods for silvering glass.

The uses of manganese have largely increased during the present year, and new and important industries appear likely to be founded upon recent discoveries of the cheap preparation of the permanganates and the metal. It is now well known that Tessié du Motay's method for the manufacture of oxygen gas is founded upon the use of the oxide of manganese and soda.

The ready way of making the manganate of soda has suggested the use of that salt for many purposes, and by degrees the permanganate has been introduced and applied as a disinfectant and for bleaching; it is for the latter purpose that the permanganates of lime and potash appear destined to become conspicuous. Disinfecting and bleaching are essentially founded on the same chemical process; for the former only small quantities of material are required, while for the latter the demand was much beyond the possibility of the supply. It has now been proved that the permanganates are among the best bleaching agents we have, and the past few months have shown the possibility of supplying them cheaply and in any quantity. No chemical progress of recent date is of more importance than this application of permanganic acid as a disinfecting and bleaching agent.

We have also to note the use of metallic manganese in combination with copper. Cupro-manganese is a white alloy closely resembling German silver, and possessing many of the valuable properties of the older alloy. It can be substituted for German silver in plated ware, and is now manufactured and successfully applied in Connecticut. There was formerly an insurmountable obstacle in the way of the use of manganese, and that was the production of the necessary heat to fuse it. This difficulty has now been overcome by the use of Siemen's furnace, and the alloy of copper and manganese is readily accomplished. We shall probably hear of its introduction as a substitute for the much more expensive alloy of nickel, and can now anticipate the manufacture of manganese steel more largely than ever before.

The progress in the economical use of products that were formerly wasted, has been satisfactory during the past six months. Earth closets have become better known, and by degrees we shall not only avoid the waste attending upon the old system, but also the frequent diseases and discomfort that custom has fastened upon us. The waste of coal-tar products is fast disappearing, and as we have recently had occasion to remark, so great has been the progress of discovery in the new application of the liquid and solid products of the distillation of coal that we may expect to see retorts erected for the purpose of producing them, rather than for the manufacture of gas. Gas will become an incidental product, while the object sought will be the tar from which to make aniline colors, and anthracene from which to manufacture alizarine and artificial madder dyes.

The manufacture and use of the hydrate of chloral, although not started this year, may be properly said to belong to it, as it has received its chief development within the last six months. This medicine may be pronounced the most valuable contribution of chemistry to *materia medica* that has been made for a long time.

The progress made in the uses of glycerin is worthy of note, and in nothing was it more unexpected than in the preparation of elastic sponge. By this recent improvement we have refuse sponge rendered available for mattresses, cushions, and other purposes. The use of glycerin in wine and beer, and for the preservation of animal substances from decay, and in medicine, is also worthy of note.

We cannot enumerate in detail each particular discovery, but have said enough to show that the recent progress of chemistry has been entirely satisfactory, and quite up to the precedents of the past few years.

STEAM ROAD ROLLING.

This method of consolidating roads, which, as our reader, are well aware, has been for the last two years under trial, both abroad and in America, seems to be entirely successful. So far as its results can be ascertained here they seem to warrant the belief that this system is destined not only to be adopted in cities but also upon rural highways, turnpikes, etc.

From abroad, we gather most encouraging accounts of the progress and results of the system in various cities of France and England. From the *Building News* we learn that Mr. Heaton, of Birmingham, calculates that an annual saving of $28,500 to that town would be effected by the use of the steam roller; the present annual expenditure for road material alone amounting to as much as $65,000. Though hesitating to assign a precise figure to the amount of saving effected by road rolling, Mr. Newlands, the Liverpool borough engineer, wrote in October, 1867, with regard to Messrs. Aveling and Porter's 30-ton roller: "Our roads are in much better order, and easier kept clean, than before its use, and our bills for macadam are not so heavy."

Mr. Newlands expects, however, that "the saving in macadam by every coating being at once consolidated will be very great, though he cannot at present put a value upon it." During the last two years, Mr. Samuel F. Holmes, the borough surveyor of Sheffield, has "used a steam road roller made by Messrs. Aveling and Porter." He finds "the saving in the cost of macadamized roads to be even greater than when rolled with a horse-roller," but he is "not yet in a position to give exact figures." He has no doubt it will increase the saving "at least 40 per cent over unrolled roads." Mr. Edward Buckham, the borough surveyor of Maidstone, writes as to the steam rolling carried out there in March, 1868, with a 15-ton Aveling and Porter roller, that "the results obtained from using the roller are economy, durability, comfort, and uniformity of section of road." Mr. Buckham considers that the constant use of a steam road roller would effect an economy in road maintenance of "at least" 20 per cent.

These are only specimens of like testimony received from London and many other places in England, and from Paris in France. The New York Central Park Commissioners have used a heavy steam roller of Aveling and Porter's make, imported for the purpose, with great success.

On Fourth avenue, Brooklyn, a most beautiful drive has been made by this process.

While the results named are highly satisfactory, we are constrained to say that in our opinion *the* steam road roller which shall be beyond question adapted to universal use on all sorts of road beds is not built. Perhaps the different nature of the materials used in road making will render it impossible to construct a roller which shall be equally adapted to all. We think this highly probable; but if so there is certainly room for the profitable employment of inventive talent in the construction of this class of machines. It has been only within a week that the proprietor of a valuable patent paving material has made inquiry at our office for something lighter, more rapid and portable than anything of the kind now in market.

We believe that the system might be extended to American country roads with great profit, provided some inventor would hit upon the right thing to do the work.

GAS AS FUEL.

It is scarcely necessary to preface what we are about to say with any remarks about the numerous family of gas-stoves for the consumption of and generation of heat from the combustion of ordinary illuminating gas. Those already introduced into market are answering a good purpose, and are both economical and convenient for many domestic purposes. We should, however, certainly fail in judgment and sagacity did we not fully comprehend the fact that the use of gas as fuel is in its infancy, and that it is destined to a far more extended application than at present obtains.

When, however, we use the term gas, we mean much more than illuminating gas; we mean all gases which by their chemical combination are capable of developing intense heat.

The old idea of separating water into its elements to reunite them and employ them as heat producing agents is perhaps no chimera. It is true that the heat thus developed will only be the equivalent of the force employed to effect the separation; and unless some natural force be by future discovery rendered available by conversion to produce the separation, no gain will result.

But recent advances in chemical discovery indicate that hydrogen as well as oxygen will eventually be obtained at so cheap a cost that they may find extensive application for heating as well as for illuminating purposes.

Be this as it may, its further discussion is foreign to the purpose of the present article, which is to institute some comparison between the relative economy of common illuminating gas and coal as combustibles for ordinary domestic purposes.

The comparison of the relative values of these materials as heat-producing agents would become extremely complicated were we to consider, in making it, all the compounds which enter into their composition. We shall find it, however, sufficiently accurate for our purpose, to consider the chief constituents of illuminating gas. These are carbon and hydrogen. To determine approximately the proportions of these elements contained in the best quality of illuminating gas, we shall take the results of the experiments of Peclet, who gives as the mean result of investigations upon the composition of coal the following:

In one thousand parts, carbon, 812 parts; hydrogen, 48 parts; oxygen, 54 parts; nitrogen and sulphur, 31 parts; ashes, 55 parts. From an analysis of eight kinds of coals, by Dr. Fyfe, we find an average of coke after distillation to be 1,254 lbs. per tun.

From Peclet's analysis we find there are on an average 1,624 lbs. of carbon in a tun of 2,000 lbs. and 96 lbs. of hydrogen. The coke (carbon), on the average being 1,254 lbs. after distillation, leaves an average of 370 lbs. of carbon converted into gas, which, added to the weight of hydrogen, makes 466 lbs. of gas as an average yield from 2,000 lbs. of coal; 27 lbs. more than an average of the weight of gas obtained from seven kinds of cannel coals by Wright. The heating power of 466 lbs. of gas, composed as above, is according to Dulong.

Carbon......	370 × 12,906=4,775,220	Heat Units.
Hydrogen....	96 × 62,535=6,003,360	Heat Units.
Totals.... 466 lbs.	10,778,580.	Heat Units.

This is all the heat that can be obtained from the gas pro

duced from a tun of coal. An average specific gravity of gas obtained from eight varieties of coal (Fyfe) is 0·629, air being 1. A cubic foot of air may be estimated as weighing 527 grains, nearly enough for our purpose, from which we compute the volume of gas corresponding to 466 lbs. as being 9,839 cubic feet. This amount is considerably lower than the best coals will produce. The cost of this gas in New York would be $3·50 per thousand cubic feet, or $34·44 for 9,839 cubic feet.

The heat developed by the combustion of an average tun (2,000 lbs.) of coal, as determined by experiments upon seventeen varieties, made by Playfair and De la Bêche, is 26,088,000 H. U., or about two and one half times the amount produced from the combustion of the gas that can be distilled from it.

It is quite evident, therefore, that if the heat be as completely utilized in the one case as in the other, that gas cannot compare in economy with coal. The heat from the combustion of gas is without doubt utilized more fully than that of coal; but, admitting that its percentage of utilization is twice, or even three times as great as that of coal, the latter would appear the cheaper fuel, at present prices, if we fail to take into account another consideration which greatly tends to reduce this disparity in cost. In coal fires, considerable expenditure of fuel is required before a degree of heat is obtained sufficient for cooking or other domestic operations; and after these operations are completed, still more is expended before the fire is extinguished, both of which expenditures are a total loss in warm weather.

With gas, however, the maximum heat is at once obtained and all expenditure may cease at once when the fire ceases to be required. This obviates the necessity of keeping fires up in the intervals between their employment. In this way large savings are made, so that even in point of economy gas may compete with coal during warm weather, while in convenience it is infinitely superior.

Thus the use of gas for minor culinary operations, heating sad-irons, etc., in the kitchen and laundry, and its application to light metallurgic and other operations in the laboratory, are constantly becoming more popular and extended; but it must be obvious that its application to the generation of steam for motive power, as has been proposed, cannot be economical, even were its price reduced to one dollar per thousand feet.

In a paper recently read before the British Association of Gas Managers by Mr. G. Goddard, he strongly urges this application, and describes an invention designed to effect the generation of steam by the combustion of gas.

The invention consists of a vertical tubular boiler, so constructed as to possess great power of generating steam, but of very small dimensions; the tubes are not more than one inch bore, and are placed very close to each other, so that an enormous heating surface is obtained; beneath the tubes on a revolving plate are a number of atmospheric burners, each supplied with a cock so that the heating power is completely under control and can be increased or diminished at pleasure, as more or less power may be required.

We have but to take the statements of Mr. Goddard to verify our opinions as to the cost of this application. He gives as the average consumption of gas per horse-power per hour, in the boiler described, 100 cubic feet. This in New York would cost for one horse-power per day of ten hours exactly $3·50. Allowing ten pounds per horse-power per hour of coal, with coal at eight dollars per tun, the same power would cost, if coal were used to produce it, only forty cents. The convenience of gas must be very great to compensate for such an increase of cost.

In a subsequent article we shall endeavor to point out some defects, and suggest some improvements in gas furnaces and stoves for domestic use.

HYDROPHOBIA AND DOG MUZZLING.

The hot weather is again upon us, and the newspapers considering it to be in season, begin to dilate upon the immense dangers of hydrophobia, and the importance of muzzling dogs. City authorities are also announcing their determination to extinguish the vital spark of heavenly flame in the bosoms of all such of the canine race as shall appear on the streets without muzzles. Nervous people are working themselves up into a state of trepidation for fear they shall be bitten.

We recently heard it proposed by an elderly, respectable-looking gentleman on board a ferry boat, to lynch even a good-natured dog who sat lolling through the meshes of a wire basket which decorated his broad nose. We are glad to say the proposition was rejected with scorn and disgust, and the respectable gentleman in the fear that the said dog—that looked as though he could not be coaxed to bite anything more animated than a well buttered beefsteak—would immediately spring at his throat, left the cabin amid the derisive laughter of his fellow passengers.

This foolish fear is very far removed from wise caution, and is certainly as baseless as it is foolish. Cases of genuine hydrophobia are extremely rare. One runs much more risk of being struck by lightning, and the latter risk is not great.

There is no doubt, however, of the wisdom of properly providing against even this small risk. This can be done without cruelty and with little trouble. Dogs do not run mad instantaneously. They show that they are ill some time before their paroxysms are dangerous. A dog that is sick should at once be attended to, and should receive humane care, or be put out of his sufferings by a kindly shot.

We are not of those who believe the season has much to do with the generation of this disease; but as there are many nervous people who do, it is perhaps well to allay their fears by some precautions. Let the dogs be muzzled but don't use a strap. A learned Irish veterinary surgeon states that the origin of this system was its supposed efficacy in preventing one dog biting another, as well as security to people. It is believed that dogs are liable to become rabid during the summer months, and hence the muzzle. The putting on of a peculiarly constructed strap upon the nose and mouth of a dog (be he ever so viciously inclined) is an effectual remedy for biting, but he declares the act to be one of great cruelty.

"If to prevent one evil another of perhaps greater extent is to be substituted, it is well to consider whether there is not still another and better remedy at hand—one devoid of cruelty. The structure and function of the nasal organ of the dog show that the ordinary mode of muzzling dogs is an act of great cruelty, and if placed in such a manner that it ceases to be cruel, then the wearing of a muzzle is a delusion and a snare. When a dog is in a passive state during hot weather, he will of necessity open his mouth and protrude the tongue. This becomes more manifest during exertion. The only way to make an ordinary muzzle bearable is to secure the actual repose of the animal. The moment the dog is called into active exertion, that moment cruelty commences. Placing a log of wood to its neck amounts to an absurdity, because it cannot possibly check his vicious propensity, should he possess any. A log of wood to be of service should be of great magnitude, or of considerable weight. There are three remedies at hand for the treatment of our canine friends, either of which may be tried, and two out of the three will be found easy of application, within the reach of all, and without objection. A wire muzzle open at the bottom will protect the public from injury, and it will at the same time enable the dog to use his respiratory organs without let or hindrance; and, further, it will not annoy him after he is accustomed to it. The second remedy is that of leading dogs when out of doors, which is perhaps the most effective remedy of the twain. The third is that of keeping them at home."

Now these remarks contain some common sense, which it would do well for people to heed. We are not ashamed to say we like a nice dog, and always feel indignant to see him ill-treated. There is nothing very new in the directions here given for the treatment of dogs, but their reiteration is justifiable in view of the fact that the public are slow to right the wrongs of dumb slaves.

PROGRESS OF INVENTION ABROAD.

Among the most interesting of the new inventions announced in our European exchanges is a new method of raising the screws of propellers—an English invention. The stern length of the propeller shaft has its inner end supported in a pivoted bearing, and a passage or way is constructed in the stern of the vessel, through which the pivoted shaft may swing upward, when lifted by a chain attached to its outer end. The inner end of the portion of the shaft which swings up in this way, extends beyond its pivoted bearing, so that raising the outer end in the manner described uncouples it from the other part of the shaft. The blades of the screw are made so that they can be folded together, and, when the screw is raised as described, they are stowed away in a recess. The shaft passes on one side of the stern part, and a sort of shutter closes the opening in the run when the shaft is down.

Another English invention, which, if we are not mistaken, was tried some years ago in this country, is an arrangement of stone-cutting and dressing machine, in which the dressing operation is performed by rotating disk cutters having conical edges, these cutters being mounted so that they revolve freely on inclined axes carried by a revolving cutter-head. The arrangement is such that the cutters make a kind of rolling cut, and their action is thus very similar to that of the "magic diamond," with which our readers are all familiar.

A London inventor has devised a method of securing sheets and panes of glass in metallic frames, so that they shall not be broken by expansion and contraction of the frames, through changes in temperature. In applying this invention to a lantern, a metal frame is constructed, which is composed of an upper and lower band, united by bars at the corners of the lantern. The panes or sheets of glass are placed upon the outside of these corner bars, and are then secured by metal bars or clips of a V-shaped or concavo-convex sectional form. These clips extend from the top to the bottom of each pane, and are secured to the upper and lower bands of the frame by means of sockets, screws, pins, or other devices which will hold them firmly, but will also allow them to be readily removed when desired. The bottom of the frame is provided with a fillet to receive the lower edge of the panes of glass, and this fillet is perforated at the bottom to permit the escape of any water that may be caught therein. By thus securing the panes or sheets of glass within, or between strips or bars of metal, without putty or other adhesive substance, they are held with sufficient firmness to prevent any vibration or displacement in their frames, while at the same time the said frames permit them to freely expand and contract under the sudden changes of temperature to which they are exposed.

A Birmingham inventor has made an improvement in water tweers for forges, which consists in forming the water tweer for hot blast with the entrance and exit air and water passages in one casting, and in affixing it directly to the water cistern and to the air-heating box or chamber without the use of separate connecting pipes. One part of the tweer passes through the water cistern, and another part passes through the center of the said heating box or chamber, and the tweer is secured to both cistern and chamber by means of flanges and screw bolts and nuts. The joints of the parts are made air and water tight by suitable packing. The air passage of the tweer is so formed that the entering air is conveyed by it through the water cistern, and then by a curvature of the passage is conducted into the air chamber where it becomes heated; the heated air from thence passes by means of another curved passage to the nose part of the tweer into the forge fire. Surrounding the air passages is the water space which opens by two openings into the water cistern, one above and the other below the entrance air passage, and the openings are so situated as to cause a circulation when the water becomes heated against the nose of the tweer.

A Manchester mechanic has invented a very ingenious method of joining the ends of old warp to the ends of a new warp in weaving. The ends of the old warp to which the ends of the new warp have to be joined are held in a clip, and the ends of the new warp are similarly held in a clip. The two sheets of warp are then placed in the machine. The sheet of old warp being placed over the sheet of new warp, they are then acted upon by the machine as follows: 1. The warp threads are laid evenly by means of brushes. 2. A pair of clips or nippers take hold of both warps after they have been laid evenly by the brushes. 3. These nippers take the threads into a pair of rollers set at an angle to tighten the warp threads. 4. The end thread of the old warp and the end thread of the new warp are detached from the other threads of the warps by a reciprocating pair of nippers. 5. The threads so taken by the reciprocating nippers are laid by other nippers over the side of a tube, by which the two threads are formed into a loop. 6. A hook passed through the tube takes hold of the ends of the two warp threads, and draws them into the tube, so forming a knot, the ends of the threads having been severed by a cutting blade or scissors to allow of this. 7. The knot is tightened by the threads being drawn through a narrow nick, which will not allow the knot to pass, and the threads are cut close to the knot.

THE STEVENS INSTITUTE OF TECHNOLOGY.

The late Mr. Stevens, of Hoboken, N. J., left $500,000 in addition to the lot and building, for the purpose of founding an institution in which technical education could be conducted on a plan analogous to that pursued at the Technological Institute, of Boston. The Trustees of the fund very wisely selected Professor Henry Morton, of Philadelphia as President and to him has been confided the important trust of putting into practical shape the will of the testator. The building is in process of construction, and is after an imposing and attractive design. It is to be built of trap rock with brown stone facing, and will eventually occupy the entire block, bounded by Fifth, Sixth, Hudson, and River streets, and will cost, when finished, $150,000.

Martha Institute, which was completed a few years ago, and has been a flourishing and useful school, will be supplementary to the Stevens Institute, and in a measure enable Professor Morton to dispense with the elementary classes.

It is not intended to make the Stevens Institute a free school, but by a judicious use of the income it is hoped that the tuition can be placed as low as $75 or $80 a year, covering all the studies of the course. A few scholarships will be established in connection with the public schools and the Martha Institute. A school of design for women is also included among the terms of the bequest.

The establishment of schools of technology is a favorable sign of the times, and will meet with the hearty support of the citizens of our country. They have become a necessity, and it is therefore with pleasure that we witness the prosperous beginning of a new enterprise in New Jersey. We shall be glad to record the opening of the Institute in the fall with a goodly number of pupils under the direction of professors of approved learning and experience.

SCIENTIFIC INTELLIGENCE.

GLYCERIN CEMENT.

Professor Hirzel of Leipzig has discovered an important use of glycerin that ought to be more generally known. He finds that when glycerin is mixed with fine and well-dried litharage, it yields a cement that is capable of a large number of applications.

All metals and nearly all solid bodies can be bound together by this cement; it is said to harden under water as readily as in the air, and to resist a temperature of 500°. It is especially recommended for such pieces of apparatus as are exposed to the action of chlorine; hydrochloric acid, sulphuric acid, sulphurous acid, and nitric acid; also the vapor of alcohol, ether, and bisulphide of carbon, as none of these agents act upon it. The cement can be used in steam engines, pumps, foundations for machinery, and, finally, as a substitute for plaster in galvano-plasty and electro-plating. The preparation of glycerin and litharge to be taken must depend somewhat upon the consistency of the cement, and its proposed uses. An excess of glycerin would retard the setting, as it does not readily evaporate. This new use of glycerin adds another application to a substance that only a few years ago was thrown away.

INFLAMMABILITY OF ROTTEN WOOD DUST.

Dry wood dust blown into a candle gives a clearer and more intense flame than resin, and the wick becomes covered with a resinous crust, so that the burning of the candle is greatly retarded. As this kind of dust when coming in contact with a candle takes fire, it is unsafe to conduct manufactures in which it plays a part at night when a light is required, and it is equally dangerous to strike a match. It appears that an accident occurred in a factory in Silesia, where wood dust was employed, by which five workmen were fatally injured.

CORK AS A NON-CONDUCTOR OF HEAT.

Cork is such a poor conductor of heat that it is largely employed about steam engines to prevent the cooling of cylinders and the consequent larger consumption of fuel. According to careful experiments, the economy in fuel amounts to

$2 for every 32 square meters of surface protected. Experiments conducted by M. Steubel, of Berlin, with locomotives, gave also entirely satisfactory results. This property of cork suggests its use in refrigerators, and if it be partially burned it would also act as a disinfectant to absorb bad gases. The refuse from the manufacture of corks ought to be tried for packings of machinery, and as a filling for ice boxes.

SODIUM.

Mr. Bell, who has made more sodium than any other manufacturer of the metals to be reduced by it, has found that, when large quantities of sodium are melted, it can be cooled in the open air without sensible loss by oxidation.

TO PREVENT THE BUMPING OF LIQUIDS.

Hugo Müller conducts a capillary glass tube through the cork to the bottom of the retort, and during the distillation passes a steady stream of carbonic acid or hydrogen through the liquid. A little piece of sodium amalgam thrown into the liquid will also frequently, by the evolution of hydrogen, prevent the boiling up of the liquid, and thus facilitate distillation. He was able, in this way, to distil rapidly very volatile liquids.

A Steep Railway.

A railway has been constructed in Pittsburgh, Pa., to carry passengers to and from the top of what is known as Coal Hill, which overlooks the city and the country around to a great distance.

The plane is located two hundred and fifty feet west of the Monongahela suspension bridge. The roadway starting from Carson street crosses the Pan Handle Railroad, and reaches the face of the hill (which at this point is ninety feet above the level of the Pan Handle Railroad track) by means of an iron bridge one hundred and sixty feet long. This bridge is supported by ten-inch columns, made of wrought-iron a quarter of an inch thick. The vertical hight of the hill at this point is three hundred and thirty feet, giving the plane a length of six hundred and fifty feet, and an inclination of thirty-five degrees. The roadway consists of two tracks, each five feet gage, with two cars—one ascending while the other descends. The cross ties on the iron bridge are yellow pine, seven feet by seven feet. The stringers are also yellow pine, six by eight feet, and the ties on the balance of the track eight feet by eight feet. A pine railing runs from the base to the top of the incline. It is three feet high and quite fancy. It is to be painted—probable white. The rails are of the "T" pattern, and substantially fastened to the stringers.

The cars are to be hauled up by a wire rope, and are provided with a safety cable which runs idly except in case of the breakage of the principal rope, when the drum about which the safety cable winds is held by means of a brake, thus preventing the accidental descent of a car.

BEAUTIFUL EXPERIMENT WITH LIGHT.—Choose a room where the sun shines in through the window, and then block out all the light, by means of a shutter or otherwise, taking care that all cracks are stopped. Then cut a hole about six inches square in the shutter, and stop the hole with two or three thicknesses of rich deep blue or bluish-purple glass. A broad beam of deep blue or purple light from the sun will thus stream down into the otherwise dark room. Then hold in the deep blue light a bottle or other article made of uranium glass. Ornamental bottles made of this glass, which is sometimes called "canary" glass, because of its light yellow color, are commonly on sale in chemists' shops. They are plentifully made to hold smelling salts, and may cost from sixpence to three shillings each. The blue light should be deep and not very brilliant. When the uranium glass bottle is held in it, the bottle will appear to glow with great beauty, with all the brilliancy of a glow worm, as if white hot.—*Septimus Piesse.*

CITY RAILROAD CARS.

We seldom treat our readers to poetry, but the annexed from *Appleton's Journal*, is too good, too truthful, to let pass.

Never full; pack 'em in;
Move up, fat men; squeeze in, thin;
Trunks, valises, boxes, bundles,
Fill up gaps as on she tumbles,
Market baskets without number,
Owners easy, nod in slumber,
Thirty seated, forty standing,
A dozen or more on either landing,
Old man lifts his signal finger,
Car slacks up, but not a linger:
He's jerked aboard by sleeve or shoulder,
Shoved inside to sweat and molder.
Toes are trod on, hats are smashed,
Dresses soiled, hoop skirts crashed.
Thieves are busy, bent on plunder;
Still we rattle on like thunder.
Packed together unwashed bodies,
Bathed in fumes of whisky toddies;
Tobacco, garlic, cheese, and lager beer
Perfume the heated atmosphere;
Old boots, pipes, leather, and tan,
And, if in luck, a "soap fat man."
Ar'n't we jolly? What a blessing!
A horse-car hash, with such a dressing!

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,544.—REFINING CAST IRON.—J. Henderson, New York city. May 27, 1870.

1,549.—SAFETY ATTACHMENT FOR STEAM GENERATORS.—H. Kimball, Randolph, Vt. May 27, 1870.

1,555.—ELECTRO-MAGNETIC MOTOR FOR SEWING MACHINES, ETC.—George Stevens and J. Hendy, San Francisco, Cal. May 27, 1870.

1,561.—REFINING TIN AND OTHER ORES.—S. H. Stevens, Grass Valley, Cal. May 28, 1870.

1,573.—APPARATUS FOR ILLUSTRATING THE MOTIONS OF SOME OF THE HEAVENLY BODIES AND VARIOUS CELESTIAL PHENOMENA.—Henry Bryant, Hartford Conn. May 30, 1870.

THE NEW YORK DOCK COMMISSION—THE PRINCIPAL PLANS SUBMITTED.

The Commissioners of the Department of Docks have held several meetings, and numerous plans have been submitted. None, however, have as yet been adopted. It is probable that the Commissioners will now hold frequent meetings, until something definite shall be determined upon. We append some of the most important of the plans proposed.

Mr. Wm. C. Waddell presented a plan proposing the construction of bulkheads and piers of stone. He advocated, also, the erection of substantial stone buildings, having not less than fifty feet elevation, to be used as receptacles or warehouses for freight delivered from shipping. He proposed, also the widening of the river streets to about 115 feet. The construction of proper stone bulkheads and warehouses, would, said Mr. Waddell, be less expensive in New York than in any other city, owing to the unlimited supply of stone which may be had in the almost immediate vicinity of the rivers, thus saving a vast amount of money necessary in other places to be laid out for transportation. He instanced the Pallisades as having been apparently put just beside the Hudson River, by nature, for the very purpose of furnishing the supply of the material necessary for building substantial pier and bulkhead structures. The warehouses ought to be built on the bulkhead line, with two cartways, right and left, to each pier. In a few cases the proposed warehouses should have the second floor, or the first above the cartways, on a level with the tracks of the street railways, which he proposed should be elevated, proper turnouts being provided at each pier, to be constructed according to this plan. This system would allow of merchandise being passed direct from the cars to the ship, and *vice versa*. This plan proposes, also, an elevated railway, to run along the river front on each side of the City, and also the connection of the great depots with the proposed Arcade Railway.

Mr. S. B. Nolan, Civil Engineer, proposes a breakwater, extending from Long Island across Buttermilk Channel, with two draws of 75 feet each in width, and a flood-gate extending from Governor's Island to the Battery, in which there should also be two draws of 75 feet each, and locks calculated to prevent the full tide from ebbing. The inventor claims that by this arrangement the ebb tide may be cut off from the East River, and (another lock being provided at the upper end, extending from Randall's Island to Westchester) the whole East River front may, at will, be converted into the most magnificent floating dock in the world. He proposes, also, the widening of Harlem River to the extent of 100 feet, and the deepening of it to 25 feet, thus not only allowing free passage for shipping, but also providing for the full flow of the tide from Flushing Bay to the Hudson River.

Mr. C. H. Pierson appeared as the advocate of Capt. J. C. Nichols, who proposes a system of stone piers and bulkheads, the plan of which is the result of his personal observation as to the construction of submarine structures in various ports in Europe, Asia, America, and Australia. He contended that stone alone should be used in the construction of piers and bulkheads; that the engineering profession for submarine structures had long since condemned the use of iron. This plan proposes the construction of piers (foundation piles, not wharves), to be made of blocks of granite laid in broken courses, transversely, and held together by rods of iron, four of which run through these blocks, one at each corner of the foundation pile. Each block is to be covered with hydraulic cement while at the surface of the water, before it is lowered to its place, or slid down on the iron rods, two of which run through each one of these blocks. The pier or foundation pile, so formed to rest on a square, flat-surfaced block of granite, of a superficial area equal to that of the whole pile itself, resting directly on the hard-pan of the river bed, and in which the iron rods are to be firmly fixed at the bottom.

Mr. Charles Pontez exhibited and explained a model of the plan proposed by him. From this model it appeared that Mr. Poultez proposes to have the lowest stratum of his piles made of iron, each pile, thus based, to rest on the hard-pan of the river bed. Upon this he proposes to build up with granite, in broken courses, and each pier or wharf to have a caisson one hundred feet in length and forty feet wide; this caisson to be ballasted for the first five feet with stone, so as to make it float with steadiness. Ten feet space is then left for storage purposes, so that a vessel may unload her cargo right alongside the pier, and get it immediately under shelter. He claimed that if his plan be adopted the necessity for an exceedingly large number of piers will be obviated, and that greater facilities for lading and unlading shipping will be given than by means of any other plan.

Mr. Wm. H. Smith submitted a plan whereby it is proposed to construct the proposed new piers on piles covered with vitrified clay to preserve them from decaying. Beyond this, there was nothing strikingly novel in this plan.

Mr. John A. Bryan proposed the construction of a bulkhead-wall all around the city, to be commenced first on the Hudson River side, between which and an inner wall east of this bulkhead should be constructed a railway to be run by steam. The advantages of this plan, he contended, were, that it would afford quick transportation between the upper and lower sections of the city; that it would permit of piers being run out from the bulkhead at any desired point, and at any time; that in its construction, neither the gas nor water pipes would be interfered with; that thus the bulkhead might be utilized and made to bring in a revenue to the city; that the general travel of the city would not be in the least degree interfered with, either while the work is being constructed or after it is finished. Mr. Bryan said that he made no hobby of saving the sewage, as others had done; he proposed to let it run to waste as it now does.

The main point he had in view was to afford means of quick and easy transportation of both freight and passengers between the two ends of the city, and, at the same time, to take the first great step toward permanently improving the water front of the metropolis. By a slight alteration in the plan, he proposed, however, the sewage might be saved, if the Commission thought it desirable to do so. He proposed that in connection with his plan, independent conduits be laid down to carry off the rainfall and snow water, which now flow into the sewers. These sewers might thus be relieved from carrying off this immense body of water and left to the exercise of their legitimate work.

The material for this wall might be easily and cheaply obtained. The railway he proposed should have eight tracks, to run at an average distance of ten feet below high-water mark. He proposed that the line of wall inside the bulkhead be of a strength just sufficient to hold the earth embanked against it, and that between this and the bulkhead be the space appropriated to the proposed railway, which might be put ten feet below the level of high-water mark, or sixteen feet below the top surface of the bulkhead which is to extend upward above high water to the distance of six feet.

Mr. J. B. Van Deusen presented a plan, accompanied by a model, of an invention of his own, whereby he proposes to construct piers of iron. His plan contemplates hollow iron columns, on which the roadway of the pier is to be built. This roadway, or pier surface, to be of stone, cast iron arches being thrown from pile to pile, on which concrete is to be laid and the stone pavement set in. The external columns of the pier he proposes to make twenty inches in diameter, and the internal ones twelve inches. To remedy the tendency to sink, which might naturally be supposed to pertain to a pier thus built on iron columns, Mr. Van Deusen proposes to insert within the tubular piles, an arrangement which he denominates a "claw base." This he places inside of, and sinks along with the column itself, and when the latter reaches the bottom or hard-pan of the river-bed, he throws out these claws under the bottom of the column; and after being thus out, they fix the column firmly in position. One great advantageous feature that he claims for his plan is, that the piers built in accordance with it will necessarily be fire-proof. As to cost, he offers to build a pier on his plan, 300 feet long by fifty feet wide, for $100,000, and to have it completed at the expiration of four months' time.

Mr. J. Burrows Hyde submitted a plan, of which the following is a synopsis compiled from the paper read by him before the Commissioners on the 29th June:

1st. The construction of a solid wall of masonry, built in intervals, as may be necessary, but with a view to its ultimate continuation along one uniform line of the shores, coincident with the present bulkhead limit Through this wall the sewerage outlets will debouch at their proper intervals. The wall will serve as a deflector for the water, which will thereby not only carry off the sewerage matter, but also the mud brought by the complex current from the Hudson and East rivers. This will prevent the eddies which form pockets or still water for the deposit of mud banks for grounding vessels at the wharves, where is consequently stored up pestilential filth to permeate the atmosphere with poisonous and intolerable odors that not only render the air at times insupportable at the wharves, but lamentably influence the sanitary condition of the population.

2d. He proposes to construct from this wall permanent iron piers, by sinking cast-iron piles or pipes to the rock of firm bottom, and filling the pipes with masonry or with concrete under pressure to form solid artificial stone—a system which has been most satisfactorily employed for years in England and elsewhere. A primary duty of the hollow columns is to serve as coffer dams for constructing the vertical supporting columns of masonry. The iron columns alone will also be amply strong to sustain the superstructure loaded to any weight it will be required to carry. They will be prepared for resisting oxidization, and will, he maintains, last as long as the warehouse itself. The piles will be so arranged as not to impede the water currents, giving free circulation to the tides for carrying away all solid matter; at the same time will allow free space for dredging under the piers, should it become necessary.

Upon these piles a cart and landing way of iron and wood will be constructed; and as he designs this structure for more than ordinary duty, it will, when completed, be loaded with a testing weight of at least double that it will be required to carry. By the present system vessels cannot ordinarily receive or discharge car goes in bad weather; besides, merchandise on the wharves is ever exposed to injury. Upwards of $300,000 a year has been paid by our merchants for the hire of tarpaulins and other wharf coverings, which afford but partial shelter for the property. Besides, a major proportion of the merchandize designed for reshipment is now transported to an average distance of five hundred yards from the river for storage, involving, in most cases, two cartages before reshipment or distribution for sale here. Moreover the crowded conditions of our streets now, by carts and drays, present a rapidly increasing embarrassment to the business facilities of the port. And as within the water limits of the city there can be presented no possible relief or alleviation of this augmenting evil, we need but ask what must be the condition a few years hence, when the population will be doubled. Mr. Hyde therefore proposes to store merchandize beyond the bulkhead line. It really seems that the carts have already reached their maximum practical number, unless the locality for our general commerce is changed, which would afford but temporary relief. Mr. Hyde submitted that all merchandize designed for export or transhipment in its received condition should never cross a street at all, and should be, as far as possible, stored at the piers, and as warehouse room is not only much limited, but greatly needed convenient to the shipping, he proposes to meet all these requirements,

3d. Employing this pier for carrying a weather shed and warehouse, and by erecting thereon a fire-proof iron building five stories in hight. The first story or pier surface being, as now, free for the cart and landing way, open on all sides, with four closed lofts above for storing merchandize The plan submitted shows a pier 500 feet long by 50 feet wide, with a warehouse 465 feet long by 35 feet wide. This gives five stores, each, say 100 feet long by 35 feet wide, divided by fire-proof partitions, and with four warehouse floors, with rails along the floors for conveying goods. Vessels will lie on either side alike, by bracing their yards fore and aft, or otherwise. He proposes, however, to increase the width over the present piers, as there is ample space for so doing.

Within the building one or more steam engines will be placed, and outside, just under the roof, strong swing cranes rigged; and through these two agencies all merchandise to and from the vessels and warehouses or wharf are conveyed, as well as directly to and from the pier below, by hatchways provided through the floors. It frequently occurs that the bulkhead end of the pier is so taken up with goods that vessels further out cannot work to advantage. By the plan proposed the floor above may be used as an auxiliary pier, and allow the loading or unloading to progress. By this system vessels will lie directly alongside of, and may discharge directly into, or receive goods directly from the piers or warehouses; the work will not be interrupted during inclement weather; and the goods may be landed and lie in perfect safety on the pier proper, if placed there to be taken away by carts. The steam engines will also be constructed for working powerful fire engines, which may be employed to extinguish fires in adjacent buildings, vessels, or otherwise. The proposed buildings being isolated and fire-proof, with unprecedented means for extinguishing fire, should any occur within the edifices, they will present unequaled security against that dreadful scourge to our commercial interests, and greatly lessen the rate of insurance on the property stored within them. The pier will be lighted by gas at proper distances at night, and the street end will be closed by gates, guarded by a watchman, to prevent the passage of improper persons.

Mr. Hyde claimed that the plan he submitted if adopted would secure the following advantages: An increase of the space for tide flow 800 feet on each river, that being in a good measure the distance as regulated from the bulkhead to the outer pier lines, the present piers acting as dams against the currents. An increase of from seven hundred to 1,000 feet to the width of the city, by adding these structures extending from each side, and which would form a line of buildings reaching from the Battery nearly to the Central Park. It will improve the harbor by permitting the tide to flow under and through the piers, carrying the sewerage washings into the channel. It will improve the health of the city by removing the sewerage matter from the present still water of the slips into the channel, which will carry it away. It will relieve the streets by stopping at the piers a great proportion of the merchandise which now has to be carted to warehouses within the city. It will enable the vessels to load and unload in at least half the time now necessary. It will greatly increase the value of the opposite property. It will greatly increase the tax revenues of both the State and the city. It will save one half the insurance. It will save cartage. It will create spacious and safe warehouses where most convenient, and upon a space now used for landing stages only, and thus relieve for active business the many buildings used for storage within the city, and relieve the sidewalks in front of them, over which goods have to pass and repass, greatly to the inconvenience and risk of pedestrians.

Mr. Hugh McKay, of Greenpoint, L. I., proposed to build a sea wall around the city, just outside the present bulkhead, said wall to be composed of two rows of square cast iron tubes side by side, and of the proper length to reach a firm foundation. The tubes are to be cast two feet by four in diameter, the out row to lap joints with the inner row, the whole to be bolted together and filled with concrete; the heads of the bolts extending into the concrete and forming anchors; these forming a strong, continuous and smooth wall without the expense of cofferdam, diver, or dredger, and capable of being built in a shorter time than any other kind of wall. To build the piers he proposed to sink three rows of the same tubes nine inches in the center and eight on each side, driven close together and bolted, and filled in with concrete as in the sea wall. Three hundred feet out of said wall, ten feet nearer the sea wall, a similar row of tubes, and four such rows between the above and sea wall, having a clear water way between each pier of about seventy feet. Close to the sea wall a single row of tubes is to be sunk, all the tubes to be sunk so that their tops shall be level with high water mark. A properly constructed tubular iron bridge eight feet high and thirty-two feet wide, to span the entire space between sea wall and pier head; the roof or deck of bridge to form the wharf proper. The inside of the bridge tube is to be used for the storage of merchandise. On a bridge or wharf of this kind sheds and storehouses can be erected as firmly as on land. As the deck of the wharf would be above the present grade of the street about four feet, all unloading and loading of carts should be done at the bulkhead, thus saving great wear and tear and confusion on the wharf. All merchandise could be carried along on the smooth floor by hand trucks or cars with ease and despatch. Between the two outer rows of tubes there should be placed a properly constructed tide wheel, to be kept in motion by the current, and to be continually employed in compressing air for the mechanical work of the pier, and also to raise the sea water to a reservoir on the top of the warehouse, to be available in case of fire; to water the streets, to fill paths, to scour the gutters and sewers, and thus

put to practical use the immense power that flows past our city. Mr. McKay thinks a wharf of this kind would give the greatest strength, with most warehouse capacity, and present the least obstruction to the ebb and flow of the tide.

Mr. A. D. Bishop submitted a plan which may be described as simply a succession of stone pillars, resting on piles, placed in position by means of a floating derrick. The cost of the construction of a pier 100 feet long, over this foundation, is estimated by Mr. Bishop at $35,000, and the cost of a pier of the same sort (granite), 45 by 400, $400.000.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

All reference to back numbers should be by volume and page.

A marine clock from Baltimore was received at this office some weeks ago. Who sends it, and for what purpose?

W. W. R., of N. J.—The substances which will generate heat, by simply coming in contact, are so numerous that it is hard to select what to recommend you. Sulphuric acid and water when mixed in the right proportions will produce a higher temperature than you mention. So will water and quicklime. Sulphuric acid acting upon chlorate of potash also creates a high degree of heat. But perhaps you mean substances that will by coming in contact, or by slight friction, produce a high degree of heat, without any chemical change. If that is your meaning, we know of no such materials.

O. S. M., of Va.—We agree with you that the method proposed to avoid the slow poisoning of workmen in paint manufactories, has theory to support it. The trouble would be to get the workmen to submit to the temporary inconveniences the plan entails. It has often been found that in attempts to promote the sanitary condition of workmen, that they generally prefer a remote risk to present inconvenience, though the latter be but slight.

C. P. T., of Mo.—We long ago discovered how rash it was to give an opinion as to the cause of a boiler explosion without being able to inspect for ourselves the state of affairs. The *ex parte* statements you send us are not enough on which to base an intelligent opinion. This much, however, we will say: It was not the generation of gas—unless steam be considered as a gas—that burst the boiler.

J. L. C., of Ill.—We should be glad to encourage you in the construction of your magnetic perpetual motion, but we cannot do so conscientiously, neither do we think the subject of such value as to warrant giving space to its discussion in our columns. This decision may seem harsh to you, but we must regard the general interests of our readers as paramount to the personal sympathy we feel in your case.

H. M., of N. Y.—The center of motion in a wagon wheel, so far as the parts of the wheel are related to each other, is in the axle; so far as the parts are related to the surface upon which the wheel rolls, the wheel has no center of motion. Whether we consider the relation of the parts of the wheel to each other, or to the surface upon which it rolls, it has no *fixed center*.

G. L. V.—Electricity has not only been thought of but actually tried as a motive force for car brakes, and also as a means of simultaneously unlocking mechanism on each car of a train, the mechanism through the power of springs or other means, to apply the brakes. There is nothing new or patentable in your invention, unless it may be some details of construction.

D. R. V., of Va.—Your friend is right. The discovery of the law called Marriotte's law—namely, that the volumes of gases are inversely as the pressures to which they are submitted—has been attributed to the English physicist, Boyle, and this law has therefore been called by some writers, Boyle's law.

A. F. S., of Texas.—The contraction of the spaces between the buckets of turbine wheels, so that the area of section at the point of discharge is less than that where the water is received, would undoubtedly result in loss of power.

D. E. W., of Mass.—The pigment called green verditer is a mixture of carbonate of copper and carbonate of lime. Blue verditer is also a carbonate of copper, or a mixture of the hydrated oxide of copper with hydrate of lime.

Q. D. O.—The cement known and quite commonly sold under the name of marine glue will unite leather, and it resists the action of water. We do not think, however, it will unite belting so as to obviate the necessity of rivets.

E. N. C., of N. H., describes the method of burning marl by the use of wood to manufacture lime. It is very expensive of fuel, and he wishes to learn of a better method. Can any of our correspondents supply this information?

D. R. P., of Fla.—Natural amalgams of mercury with silver are found in Sweden, Hungary, Spain, and other places. Dana describes a mass in the museum at Santiago, in Chili, which weighs 21·75 pounds.

R. L., of Cal.—You cannot submit stearine to a heat sufficient to distil it over without decomposing it. The products will be margaric acid, margarone, and a variety of hydrocarbons.

T. W., of Iowa.—Both the subjects to which you call attention have been recently discussed at length in these columns. We therefore decline to reopen them at present.

A. W., of Tenn.—The standard gallon contains 58372·2 grains of distilled water at 39·8° Fah. with the barometer at 30 inches.

J. K., of Mass.—The carbon used in galvanic batteries is that known as gas carbon, and is obtained from gas works.

D. V., of Mo.—We believe the sails of vessels are universally named after the mast, yard, or stay upon which they are stretched.

J. M. M., of La.—What are called Green stones are mixtures of feldspar and hornblende, or of feldspar and augite.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

MEDICAL COMPOUND.—George C. Furber, Yreka, Cal.—This invention and discovery relates to a new and useful composition for medicinal purposes.

THERMOMETER.—John Kendall, New Lebanon, N. Y.—The object of this invention is to render thermometers more convenient and serviceable in dairies, and for many other uses, and it consists in forming the scale and plate in a single piece, with flanged edges, in combination with a removable band, for protecting the bulb of the thermometer.

PREPARING DENTISTS' GOLD.—Richard S. Williams, New York city.—This invention relates to a new and useful improvement in the mode or process of preparing dentists' gold, for filling decayed teeth, whereby such gold is rendered much more useful than it has hitherto been, and it consists in subjecting the gold, after it has been rolled to the desired thickness, to the action of a solution of *aqua regia*, whereby the surface is thoroughly cleaned of all foreign particles of matter, and the gold rendered adhesive.

LOOPING HOOK FOR SEWING MACHINES.—M. A. Keables, now temporarily residing at Ontario, Canada.—This invention relates to improvements in looping hooks, and consists in attaching them to the arm of the oscillating shaft, by which they are worked, on a pivot, so that they can vibrate thereon in a vertical plane, to allow the point to be raised by the action of the thread at the moment of the escape of the loop, to facilitate the same, and in providing a spring to restore it, afterward, to the required position, and hold it there.

TRACTION ENGINE.—Thomas F. Hall, Omaha, Nebraska.—This invention relates to a new traction engine, or construction of vehicle, of that class in which an endless belt of traction plates surrounds an inner frame, and travels around the same while propelling the entire apparatus.

STOVES.—C. E. Warring, Poughkeepsie, N. Y.—This invention relates to improvements in stoves, and consists in a detachable coal magazine, or base-burning attachment for heating stoves, adapted for application to stoves of any kind, having an opening at the top.

BALANCE SLIDE VALVE.—Wm. Dillon, Wheeling, W. Va.—This invention relates to improvements in balanced slide valves, and consists in suspending the valve by long adjustable rods, from a diaphragm in the top of a dome, placed upon the steam chest, the same diaphragm being made of flexible substance, and sustaining the same pressure as the valve does.

TOOL FOR DRIVING GLAZIERS' POINTS.—Alfred Woodworth and Edwin W. Warren, Cambridge, N. Y.—This invention relates to improvements in machines or tools for driving glaziers' points, and consists in a hand-tool having a vertical receptacle for the points, and a spring device, arranged to strike the lowest point in the receptacle, and force it out through a slot thread, the said spring driver being provided with a retracting paul, which trips the device and re-engages with it self-actingly.

QUILTING FRAME.—John Angus and John P. Angus, Mindenville, N. Y.—This invention relates to improvements in quilting frames, and consists in a combination of a roller for the lining, a roller for the top, another roller for both the lining and top, and a stretcher bar, all so arranged that the bats may be applied as the lining and top are wound on to the latter roller from the others, after which, both the top and lining, together with the bats are wound back on to one of the other rollers, to be quilted.

CLOTHES DRYER.—A. H. Patch, Hamilton, Mass.—This invention relates to improvements in apparatus for suspending clothes, for drying them, and consists in long bars, for hanging the clothes, suspended from cords, working over pulleys attached to the ceiling of the room, or a horizontal supporting beam, and thence passing to and over pulleys attached to the wall or a post and down the same, to a convenient position for attaching to pins or hooks for holding the bars in a low position for convenience in hanging the clothes on them, or in a high position for drying, where they will be out of the way.

SEAL LOCKS.—Gustave Ulmann, Ivry-sur-Seine, France.—This invention relates to improvements in seal locks, for mail bags, and other like uses, for guarding against the same being opened without giving evidence of the fact, and it consists of a hollow block of metal, for the reception of the hasp or bolt to be secured, and a spring bolt to be inserted, passing through the hasp, and catching, by its spring, behind shoulders, which prevent it from being drawn back; also, of a plate, perforated, for attachment to one side for securing the seal, the said plate having a bolt or stud through which the locking bolt also passes, and by which it is held, and, also, of a disk and perforating stud, which, when in the locked position, prevents the removal of the locking pin, or bolt, without perforating the seal.

TONGUE HOLDER FOR DENTISTS' USE.—Francis M. Osborn, Port Chester, N. Y.—This invention relates to improvements in tongue holders, such as used by dentists, to prevent the tongue of the patient from interfering with the filling of the teeth, or other operations thereon, and consists in a cone or bell-shaped cup of india-rubber, or other substance, and a deep, wedge-shaped slot in one side, which is mounted on a handle, and adapted for placing on the tongue, forcing it back, and holding it as required. It also consists in the application to the handle of projections, adapted to engage with the front teeth of the lower jaw, and hold the cup against the efforts of the tongue to thrust it out of the mouth.

LOCKING DEVICE FOR TRAPS.—Jasper E. Corning, Rye, N. Y.—This invention relates to improvements in devices for locking the doors of wire and other animal traps, having doors swinging in vertical planes, and consists in the application to rods on the door, which assume vertical, or nearly vertical positions when the door is closed, and to fixed vertical rods, arranged to be parallel, or nearly so, with the said rods on the door, when the latter s closed, of locking rings, which will drop to the bottom and hold the door against swinging open until the rings are raised, which may be done most readily by turning the traps bottom-side up, and allowing them to fall to the top of the trap, where they are retained by the aforesaid rods, attached to the doors after the latter are opened.

PUMP.—Anson Balding, Wheeling, West Va.—This invention has for its object to produce a constant stream of water from a pump cylinder by the operation of a single double-acting hollow piston, which receives water nto its chamber alternately through orifices in its upper and lowers disks, according as the piston moves up or down, and discharges the same through its hollow piston rod; the water having been filtered previous to its introduction to the cylinder.

GLUE.—Nelson S. Whipple, Detroit, Mich.—This invention has for its object to furnish an improved glue for use upon wood, crockery, glass, marble, leather, metals, etc., which shall be simple in preparation, and will hold the parts to which it may be applied firmly in place, and which shall have a much greater adhesive power than any glue heretofore made.

REGISTER AND VENTILATOR.—Alfred Watson, Jersey City, N. J.—This invention has for its object to furnish an improved register for regulating the admission of warm or cold air in warming or ventilating buildings, which shall be so constructed as to greatly diminish the time and labor required for "fitting" the register, and consequently materially lessening the cost of manufacture.

STEEL BOWS FOR CARRIAGE TOPS.—J. F. Fowler, Alliance, Ohio.—This invention relates to a new and useful improvement in bows for the tops of carriages, buggies, etc., whereby they are made more durable, and are made to present a lighter and more elegant appearance than bows made in ordinary manner.

SIDE SADDLE.—William Hill, New York city.—This invention relates to a new and useful improvement in side saddles, whereby beauty, simplicity, and cheapness are secured, and it consists in combining in one piece the seat piece, "spring piece" and "jockey" of the tree covering.

BRIDLE BIT.—Henry C. Thompson, Mount Sterling, Ky.—This invention consists in the combination of two bits, one passing through a slot made nearly centrally of the other, the two bits being bound together by straps, in such manner that one may slide upon the other, and the joint bit elongated by drawing the bridle-rein rings, one of which is at the extremity of one of the bits, and the other of which is at the opposite extremity of the bit, away from each other, so as to increase the leverage upon the horse's mouth, while, at the same time, the curb-rein rings and cheek pieces are drawn toward each other, and compressed tightly against the horse's cheeks, by which means an unruly animal is the more easily controlled.

STEAM VALVE.—George Leckenby, Western, Mo.—This improved valve consists of a circular case with valve seat for attachment to the steam cylinder, having the ordinary live steam ports, in which case is a hollow cylindrical valve, receiving the live steam around the shaft which is hollow, and supplying it through the rim to the live steam ports, and receiving the exhaust therefrom into a passage leading from the rim to the motion shaft, by which it is discharged.

DREDGING MACHINE.—Ralph R. Osgood, Troy, N. Y.—This invention relates to a new mechanism for operating the scraper or scoop of a dredging machine, and for regulating the position of the same. The invention consists first in the use of double friction clutches, whereby the rigid shank of the scraper can be drawn in and out at will.

IRONING MACHINE.—William Jones, Oskosh, Wis.—This invention relates to a new and useful improvement in a machine for ironing clothes, whereby that tedious and laborious operation is rendered easy and agreeable, and it consists in the arrangement of a hollow self-adjusting steam heated roller operating in combination with other solid rollers, and a table and revolving apron.

TUNING PIN FOR PIANOFORTES.—Julius M. B aig, New York city.—This invention has for its object to improve that class of tuning pins for pianofortes, which are operated by means of screws and worm wheels, and more particularly to strengthen such pins and to lessen the cost of their construction.

MANUFACTURE OF STEEL AND IRON.—G. F. Ansell, London, England.—This invention relates to the conversion of iron into steel or wrought iron, for armor plates, railways, and for other purposes, by the use of bisulphate of potash, or the bisulphate of soda, or a mixture of the two, the same being applied in such a manner as to act throughout the mass of melted metal.

ANIMAL TRAP.—Elonzo Sprague and George C. Belt, Bridgeton, Ind.—This invention has for its object to construct a trap, by means of which animals can be readily caught, and which will always remain set without any liability of getting out of order. The invention consists in providing a double treadle in an open passage, each treadle operating a gate, whereby the escape of an animal, once within the passage is absolutely prevented.

MOLD FOR CASTING SPOONS.—Luther Boardman and N. S. Boardman East Haddam, Conn.—This invention has for its object to reduce the expense of molds for casting spoons of britannia or other metal.

MUFF.—R. M. Seldis, New York city.—This invention relates to a new manner of securing pocket flaps on muffs, with a view of economizing material and labor in their manufacture.

FLOCK GRINDER.—Robert Aldrich, Forestdale, R. I.—This invention relates to a new construction of flock grinder, and more particularly to a new method of securing the knives in the grinding surfaces, with a view of adjusting the same to different kinds of work, and to provide for wear by the operation of grinding.

SAPONIFIED MINERAL BATH.—Otto Gavron, New York city.—This invention has for its object to furnish a convenient surrogate for mineral baths, which can be brought into a condensed form to be conveniently transported and handy for use. The invention consists in combining the minerals and salts that are contained in the mineral waters with soap, so that the soap thus prepared can be used in baths with the same effect as the mineral waters alone.

HAT AND CAP SWEATS.—Philipp F. Lenhart, Brooklyn, N. Y.—This invention has for its object to improve the sweat bands of hats and caps in such manner that the same will be more convenient and less injurious to health than those now in use. The invention consists in a novel treatment of the leather for the purpose of making the same water-proof, and still an absorbent of moisture.

CARPENTERS' PLANE.—Charles G. Miller, Brattleboro, Vt.—This invention has for its object to construct a plane which will be convertible into a grooving, rabbeting, or ordinary smoothing plane, and which therefore combines in one tool all the advantages heretofore included in three.

CHURNING APPARATUS.—James P. Curtis, Wytheville, Va.—This invention has for its object to furnish an improved churning apparatus which shall be so constructed and arranged that the operation of churning may be changed from a labor to a pleasure, enabling even a child to work the machine, and which shall, at the same time, bring the butter quickly and thoroughly.

LAMP-SHADE HOLDER.—Cornelius St. John, New York city.—The object of this invention is to furnish an improved lamp-shade holder, simple in construction, easily attached to and detached from the lamp, and which shall be so arranged as to allow the shade to be expanded or contracted at will.

CULTIVATOR PLOW.—James G. Miner, Nashville, Tenn.—This invention has for its object to furnish an improved plow which shall be so constructed as to cut up all the weeds and grass between two rows at a single passage, and turn up their roots so that they may be killed by the sun.

SEATS FOR VEHICLES.—P. F. Dean, Watsonville, Cal.—This invention has for its object to furnish an improved seat for buggies, carriages, cars, and other vehicles, so that when in use they may be easier to the rider.

INSIDE WINDOW BLIND.—Stephen Eich, East Toledo, Ohio.—This invention has for its object to furnish an improved inside blind for windows which shall be simple in construction and effective in operation, being so constructed that it may be closed so closely as not only to shut out the light, but also to prevent the entrance of flies and other insects, and which may at the same time be made light and ornamental.

WOOD BOX.—Frank Ficht, Dyckesville, Wis.—This invention has for its object to furnish an improved box for holding fire wood when prepared for the stove, which shall be neat in appearance, convenient in use, and easily kept clean.

SAFE LOCK.—Ludwig Beer, New York city.—This invention relates to improvements in that kind of locks in which a slotted key is applied to shift a series of slides or plates which serve as levers for turning a slotted locking cylinder, by which the bolt is moved. The invention consists chiefly in the application to the locking cylinder of a primary lock, which, engaging pins in a notch of said cylinder, prevents the same from being turned, even if the slides are properly set to unlock.

BOILER PLUG.—Robert L. Neill, Paterson, N. J.—This invention has for its object to economize boiler plugs which are, during the testing of the plates, used to close the holes that are provided for the reception of the tubes.

MEDICAL COMPOUND.—Wm. C. Tait, Alexandria, La.—This invention relates to a new and useful improvement in a compound to be used as a medicine for coughs and for all affections of the lungs or bronchial tubes, and other affections of the human system proceeding from colds, exposure, or other causes.

PROCESS OF CONCENTRATING TOMATOES.—Christopher T. Provost, New York city.—This invention has for its object to so prepare tomatoes for preservation, that only the nutritious and aromatic matter, but none of the useless bulk or body will be retained. The fruit can thereby be preserved in the most concentrated form, and will not occupy superfluous space.

DOOR AND SAFE LOCK.—Joseph Linder, Seneca Falls, N. Y.—This invention relates to a new construction of lock and key, with an object of preventing the opening of the lock by means of false keys. The invention consists chiefly in provision of complicate bolts and double key, all arranged so that a single key or bolt will not suffice to open the lock.

SIDE SADDLE TREE.—William Hill, New York city.—This invention relates to a new and useful improvement in trees for side saddles, whereby the strength, beauty, and utility of that article is increased while it is greatly simplified in its construction, and its cost diminished.

MOWING AND REAPING MACHINES.—Francis E. Rogers, Paw Paw, Ill.—This invention relates to new and useful improvements in mowing and reaping machines, having for its object to provide an arrangement of the cutting sections, whereby power may be economized, the cutters more easily detached for grinding, and the machines made to run with less noise than those now in use.

EXCAVATOR.—Benjamin Slusser, Sidney, Ohio.—This invention consists mainly in a scraper placed by the side of each of the rollers over which the endless apron runs, so as to clear the same of dirt, said scraper being attached at its ends to the boxes in which the rollers are mounted, so that whenever the boxes with the rollers are moved in one direction or the other in the frame, the scrapers are moved also to the same extent, and always preserve the same position relative to the rollers.

COMBINED CALL BELL AND SLOP BOWL.—Nathan Lawrence, Taunton Mass.—This invention consists of a metallic slop bowl provided with a threaded stem projecting downward from its under side, and with a horizontal arm connecting any two of its adjacent legs, on which arm is pivoted the thumb-piece and tongue of a call bell; and combined with the sounder of a call bell when the latter is either screwed upon the aforesaid projecting threaded stem, or slipped thereon and held by a nut.

FIRE AND DECK PUMP.—Peter M. and Oscar Snell, Williamsburgh, Ohio.—This invention consists in the application of a lever having a movable fulcrum placed in vertical slots, said fulcrum being directly connected with a slide valve to the operation of the piston of a force pump, for the purpose of giving the slide valve the movement requisite to opening and closing the cylinder ports.

WASHING MACHINE.—Gideon W. Cottingham, Marshall, Texas.—This invention consists of a globular case for containing clothes, provided with slots for admitting water, the globular case being intended to be suspended on trunnions in a vessel containing hot water, and to be revolved therein for the purpose of causing currents of water to flow through the case among the clothes.

INVALIDS' BEDSTEAD.—A. J. Russell, Baltimore, Md.—This invention relates to the simultaneous employment of two bedsteads, one above and outside the other, the inner one sustaining merely the mattress, and the upper one being provided with a contrivance for raising and lowering and supporting the other bedding, that part of which—that is, beneath the patient—being so contrived, that it may be removed and replaced without lifting the patient off the bed, and without in any way disturbing him.

STILL.—E. Melton, Flemmingsburg, Ky.—This invention relates to that class of stills in which the alcohol is carried off by steam ejected into the wash at the bottom of the chambers, and rising through the wash and passing off, charged with alcoholic vapor, to the refrigeratory.

BUCK SAW.—William Hankin, Williamsburgh, N. Y.—This invention relates to a new brace for buck saws, and has for its object to simplify the construction of saw brace and still permit the adjustment of the saw frame. The invention consists in constructing the said brace with forked ends and double arched edges, of one single piece of wood or other material, thereby producing an entirely reliable and inexpensive article.

STUMP EXTRACTOR.—C. Bilharz, Pittsylvania C. H., Va.—The object of this invention is to provide a stump extractor which will be yielding during operation, so that it will not require a change of position if by the weight of a stump one side should draw heavier than the other. The invention consists chiefly in suspending the entire operating apparatus from a semi-spherical yoke, which rests upon a perforated plate, so as to be swiveled thereon.

HAY AND COTTON PRESS.—Richard Ball, Petersburgh, Va.—This invention has for its object to provide means whereby the parts of a press will be kept from injury, even if the follower should not be held entirely level during its vertical adjustment. The invention consists chiefly in the application to the followers of swinging nuts and in the combination with the swing of right and left screws.

RAILROAD CAR SPITTOONS.—M. J. Beach, Nashville, Tenn.—This invention has for its object to furnish a spittoon for cars, which may be placed on and extended through the floor and allow the contents to be easily emptied upon the ground under the cars.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING June 28, 1870.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$10
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years..........$1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from..........$1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them..........$1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York

104,683.—BELT BUCKLE.—Israel Alexander, San Francisco, Cal.
104,684.—ANIMAL TRAP.—Charles Angle, Hazel Green, Mich.
104,685.—QUILTING FRAME.—John Angus and John P. Angus, Mindenville, N. Y.
104,686.—MANUFACTURE OF IRON AND STEEL.—George F. Ansell, Bernard street, Russell Square, England.
104,687.—LAPPET LOOM.—William Aspinall, Philadelphia, Pa.
104,688.—PUMP.—Anson Balding, Wheeling, West Va.
104,689.—HAY AND COTTON PRESS.—Richard Ball, Petersburg, Va.
104,690.—SLEIGH BELL.—Wm. E. Barton, East Hampton, Conn.
104,691.—RAILROAD CAR SPITTOON.—William James Beach, Nashville, Tenn.
104,692.—STUMP EXTRACTOR.—Candidus Bilharz, Pittsylvania Court House, Va.
104,693.—CORN HUSKING MACHINE.—T. J. Burgess, Rondout, N. Y.
104,694.—LIME SPREADER.—W. C. Burnett, Burns' Mills, Pa.
104,695.—HARVESTER.—James Birch and Addison Crosby, Westfield N. Y., and Thomas Birch, Meadville, Pa.
104,696.—STEAM HEATER.—George W. Blake, New York city.
104,697.—WATER WHEEL.—Oliver J. Bollinger, York, Pa.
104,698.—BAG HOLDER.—Edwin Boynton, Palmyra, Wis.
104,699.—BIRD CAGE.—Thomas H. Bradley, St. Louis, Mo.
104,700.—PREPARATION OF WHEAT FOR FOOD.—William S. Brewster, Chicago, Ill.
104,701.—STAMP CANCELER.—Franklin W. Brooks, New York city.
104,702.—SNAP HOOK.—George A. Brown, Kalamazoo, Mich.
104,703.—COMBINED HEARTH, GRATE, AND FENDER.—Geo. Buchanan, Washington, Pa.
104,704.—CAR COUPLING.—Samuel P. Carll and Amos Shute, Richmond, Ind.
104,705.—OFF-BEARING APPARATUS FOR BRICK MACHINES.—Cyrus Chambers, Jr., Philadelphia, Pa.
104,706.—DEVICE FOR TENDERING OR CHOPPING MEAT.—Fred. W. Codding, West Rutland, Mass.
104,707.—STREET SWEEPING MACHINE.—Alexander A. Consalvi, New York city. Antedated June 18, 1870.
104,708.—WASHING MACHINE.—G. W. Cottingham, Marshall, Texas.
104,709.—LAMP BURNER.—Robert R. Crosby, Boston, Mass.
104,710.—CHURNING APPARATUS.—Jas. P. Curtis, Wytheville, Va.
104,711.—MUSTACHE SHIELD FOR CUPS.—George P. Cutler, Lawrence, Mass.
104,712.—KNOB LATCH.—John Davis, Terre Haute, Ind.
104,713.—METALLIC ROOFING.—John B. Davis, Cleveland, Ohio.
104,714.—SEAT FOR VEHICLES.—P. F. Dean, Watsonville, Cal.
104,715.—BALANCE SLIDE VALVE.—Wm. Dillon, Wheeling, West Va.
104,716.—APPARATUS FOR CARBURETING AIR.—Antoine E. Dupas, Paris, France, and Arthur Barbarin, New Orleans, La.
104,717.—WINDOW BLIND.—Stephen Eich, East Toledo, Ohio.
104,718.—END FASTENER FOR CAR SPRINGS.—Geo. Elliot, St. Louis, Mo.
104,719.—COMPOUND FOR STUFFING AND TANNING HIDES.—Elihu England, Mossy Creek, Tenn.
104,720.—CLOTHES PIN.—G. K. Farrington, Alcatraz Island, Cal.
104,721.—LINIMENT FOR TREATING NEURALGIA, ETC.—Geo. L. Fearis, Connersville, Ind.
104,722.—WASH BOILER.—Benjamin G. Fitzhugh, Frederick, Md.
104,723.—GAS BURNER.—C. S. Ford (assignor to himself and Charles Young), Philadelphia, Pa.
104,724.—BOW FOR CARRIAGE TOPS.—J. F. Fowler, Alliance, Ohio.
104,725.—WASHING MACHINE.—Sam. C. Frink, Indianapolis, Ind.
104,726.—WATER WHEEL.—Olney Fuller, Bennington, Vt.
104,727.—MEDICAL COMPOUND.—George C. Furber, Yreka Cal.
104,728.—GRAIN CLEANER AND SEPARATOR.—Wm. Gardner, Catalpa, Ky.
104,729.—CORN PLOW.—Marcellus R. Goff, Delavan, Wis.
104,730.—COFFIN FASTENING.—Wm. Hamilton, Allegheny City, Pa.
104,731.—ELEVATOR.—William Hamilton, Allegheny City, Pa.
104,732.—NEEDLE SHARPENER.—Edgar K. Haynes, Boston, Mass.
104,733.—SHANK LASTER AND PUNCH.—Frederick Henderson, Marietta, assignor to himself and G. H. Bell, Portsmouth, Ohio. Antedated June 23, 1870.
104,734.—DEPILATING AND TANNING HIDES AND SKINS.—John Henry, New York city.
104,735.—ASH SIFTER.—Lewis G. Hoffman, Albany, N. Y.
104,736.—DUMPING MACHINE.—Geo. W. Hough and Wm. S. Hough, Galva, Ill.
104,737.—BURIAL CASE.—Ralph Hunt, Milford, N. J., assignor to D. M. Sprogle, Annapolis, Md.
104,738.—CAR BRAKE.—Reuben Hurd, Morrison, Ill.
104,739.—APPARATUS AND PROCESS FOR THE MANUFACTURE OF SOAPS.—Moses Hyde and Francis Hyde, Baltimore, Md.
104,740.—IRONING MACHINE.—William Jones, Oshkosh, Wis.
104,741.—TANNING.—James Kidder, Urbana, Ohio, assignor to himself and James F. Shumate.
104,742.—APPARATUS FOR ELEVATING BEER.—Albert H. Ladner and Thomas F. Fenlin, Philadelphia, Pa.
104,743.—TABLE CASTER.—C. H. Latham (assignor to Woods, Sherwood, & Co.), Lowell, Mass.
104,744.—ENGRAVING MACHINE.—John D. Lathrop (assignor, by mesne assignments, to Lippiatt, Maltby & Morse), New York city
104,745.—LANTERN.—Lemuel W. Leary, Norfolk, Va.
104,746.—ROTARY STEAM VALVE.—Geo. Leckenby, Western, Mo.
104,747.—SHEET-METAL CAN.—Joseph Le Comte and Geo. H. Perkins, Brooklyn, N. Y.
104,748.—FLAT OR SADIRON.—Luther Lincoln, Norton, Mass. Antedated June 9, 1870.
104,749.—DOOR LOCK.—Joseph Linder, Seneca Falls, N. Y.
104,750.—CAR COUPLING.—J. A. Mason, Keokuk, Iowa.
104,751.—LATHE.—F. B. Mattson, Rockford, Ill., assignor to himself and Wm. P. Dennis.
104,752.—STILL FOR SPIRITS.—Elijah Melton, Flemingsburg, Ky.
104,753.—CARPENTERS' PLANE.—C. G. Miller, Brattleborough, Vt.
104,754.—CULTIVATOR PLOW.—James G. Miner, Nashville, Tenn.
104,755.—PUNCHING MACHINE.—Charles S. Moseley, Elgin, Ill.
104,756.—SAFETY PINION FOR WATCHES.—C. S. Moseley, Elgin, Ill.
104,757.—DREDGING MACHINE.—Ralph Robert Osgood, Troy, N. Y.
104,758.—MEDICAL COMPOUND.—Edward Myers, Davis, Ill.
104,759.—BOILER-TUBE PLUG.—Robert L. Neill, Paterson, N. J.
104,760.—CASE FOR SCISSORS.—David B. Page, Henry, Ill. Antedated June 16, 1869.
104,761.—CLOTHES DRYER.—Asahel H. Patch, Hamilton, Mass.
104,762.—STREET-RAILWAY CAR TRUCK.—J. R. Perry, D. W Perry, and James Perry, Wilkesbarre, Pa.
104,763.—CULTIVATOR.—John Wesley Philip, Humboldt Tenn.
104,764.—TEAPOT.—Nathaniel Plympton, Boston, Mass.
104,765.—REFRIGERATOR RAILROAD CAR.—Joseph D. Potts, Philadelphia, and Benjamin P. Lamason, Milton, Pa., assignors to Empire Transportation Company.
104,766.—BOTTLE STOPPER.—Henry C. Pratt, Boston, Mass.
104,767.—WINDOW-SHADE RACK.—Joshua Pusey, Philadelphia, Pa.
104,768.—AUTOMATIC FAN.—David Ramler, Union Deposit, Pa.
104,769.—PUNCH.—Isaac P. Richards, Whitinsville, Mass.
104,770.—BAND SAWING MACHINE.—John Richards and W. H. Thorne, Philadelphia, Pa.
104,771.—STOVE AND FURNITURE LEG.—H. R. Robbins, Baltimore, Md.
104,772.—STEAM HEATER.—John J. Roeper, Philadelphia, Pa.
104,773.—HARVESTER CUTTER.—Francis E. Rogers, Paw Paw, Ill.
104,774.—INVALID BEDSTEAD.—A. J. Russell (assignor to himself and W. W. Rowles), Baltimore, Md. Antedated June 16, 1870.
104,775.—BREECH-LOADING FIRE-ARM.—Sven Rydbeck, Red Wing, Minn.
104,776.—IRONING MACHINE.—Alvah C. Sawyer, Canton, N. Y.
104,777.—MOLD FOR CAR WHEELS.—John K. Sax, Pittston, Pa.
104,778.—WOOD PAVEMENT.—Joseph J. Schroyer, Springfield, Ill.
104,779.—KNIFE FOR CUTTING SHEAF BANDS.—Henry Sears, and E. B. Sears, Rockford, Ill.
104,780.—MUFF.—R. M. Seldis, New York city.
104,781.—APPARATUS FOR BLEACHING PAPER STOCK.—Francis Shelden (assignor to the Union Machine Company), Fitchburg, Mass.
104,782.—EXCAVATOR.—Benjamin Slusser, Sidney, Ohio.
104,783.—MILL GEARING.—Harlow M. Smith, Peoria, Ill.
104,784.—GRAIN-FANNING AND SEPARATING MACHINE.—J. I. Smith and W. H. Nicodemus, Frederick, Md.
104,785.—MANUFACTURE OF STEEL-HEADED HORSESHOE NAILS.—J. H. Smith, Allegheny City, Pa.
104,786.—PUMP.—P. M. Snell and Oscar Snell, Williamsburg, Ohio.
104,787.—BROOM HOLDER.—C. P. Snow (assignor to Sterne F. Aspinwall), Freeport, Ill.
104,788.—FRUIT DRYER.—George M. Sternberg, Fort Riley Kansas.
104,789.—FEED-WATER HEATER AND FILTER.—E. R. Stilwell, Dayton, Ohio.
104,790.—FLOOR CLAMP.—Oliver Taff, Whitestone, N. Y Antedated June 16, 1870.
104,791.—MEDICAL COMPOUND.—Wm. C. Tait, Alexandria, La.
104,792.—STEEL CAR WHEEL.—J. B. Tarr, Fairhaven, Mass. Antedated June 18, 1870.
104,793.—BRIDLE BIT.—Henry C. Thompson, Mount Sterling Ky.
104,794.—BOTTLE STOPPER.—Nathan Thompson, Brooklyn, N. Y.
104,795.—POTTERY MACHINE.—S. R. Thompson, Portsmouth, N. H.
104,796.—MANUFACTURE OF SOAP.—Joseph Treat, New York city.
104,797.—BORING MACHINE.—William Tucker, Fiskedale, Mass.
104,798.—INSTRUMENT FOR TESTING OILS.—Peter H. Vander Weyde, New York city. Antedated June 6, 1870.
104,799.—MACHINE FOR HULLING COTTON SEED, ETC.—A J. Vandegrift, Covington, Ky.
104,800.—CHURN.—Stroud Van Meter, Henderson, Ill.
104,801.—HEATING STOVE.—C. E. Warring, Poughkeepsie, N. Y.
104,802.—HOT-AIR REGISTER.—Alfred Watson, Jersey City, N. J.
104,803.—EXTENSION LADDER.—Thomas Watson and Chas. Perry, Brooklyn, N. Y. Antedated June 23, 1870.
104,804.—TWEER.—Peter L. Weimer, Lebanon, Pa.
104,805.—LUBRICATING JOURNAL BEARINGS.—I. P. Wendell (assignor to himself and S. P. M. Tasker) Philadelphia, Pa.
104,806.—HARNESS.—Lewis Whitehead, Nunda, N. Y.

104,807.—Cooking Stove.—J. B Wilkinson, Troy, N. Y.
104,808.—Reed for Looms.—J. H. Williams, Pleasant Hill, Ohio.
104,809.—Mosquito-screen Frame.—W. W. Wooley, New York city.
104,810.—Wash Boiler.—Harrison Yost (assignor to himself and Henry Yost), Dayton, Ohio.
104,811.—Faucet.—Emil Young, Cleveland, Ohio.
104,812.—Emery Soap for Polishing and Cleansing.—D. D. W. Abbott (assignor to himself and Henry W. Peabody & Co.), Boston, Mass.
104,813.—Flock Grinder.—Robert Aldrich, Forestdale, R. I., assignor to himself and E. D. Wilcox, Millville, Mass.
104,814.—Refrigerator for Condensing Vapors from Fermenting Vats in Breweries, etc.—Lawrence Angster, Newark, N. J.
104,815.—Method for Securing the Seats and Backs of Chairs, Sofas, etc.—Lucas Baker, Templeton, Mass.
104,816.—Fare Box for Passenger Cars.—Henry Baranger (assignor to himself and J. P. Bradbey), St. Louis, Mo. Antedated June 16, 1870.
104,817.—Machine for Packing Flour, etc.—Wm. Bashor, Johnson City, Tenn.
104,818.—Machine for Scouring and Washing Fabrics.—Wm. Bates and Frederick Bates, Sowerby Bridge, near Halifax, England. Patented in England, December 14, 1867.
104,819.—Fulling Mill.—William Bates and Frederic Bates, Sowerby Bridge, near Halifax, England. Patented in England, March 16, 1866.
104,820.—Steam Generator.—William Baxter (assignor to W. D. Russell and P. T. Speer), Newark, N. J.
104,821.—Lubricating Journal.—Charles Bean, Providence, R. I.
104,822.—Spoon Mold.—Luther Boardman and N. S. Boardman, East Haddam, Conn.
104,823.—Door Key.—James Brady (assignor to the Branford Lock Works), Branford, Conn.
104,824.—Hollow Metallic Rim or Felly.—S. R. Bryant, Waterford, Pa.
104,825.—Fluting Machine.—Mary P. Carpenter, San Francisco, Cal.
104,826.—Rubber Roller for Wringers, etc.—D. H. Chamberlain, West Roxbury, Mass.
104,827.—Rake Attachment for Reapers.—M.C. Chamberlin, Plain View, Minn.
104,828.—Method of Lasting Boots and Shoes.—Wm. Chambers, Lynn, Mass.
104,829.—Teapot Handle. — Lucas C. Clark, Plantsville, Conn.
104,830.—Machine for Grinding Saw Teeth.—Wm. Clemson, Middletown, N. Y.
104,831.—Rubber Eraser.—M. D. Converse, London, Ohio, and F. A. Bates, Boston, Mass.
104,832.—Bee Protector.—J. Cory, Holden, Me.
104,833.—Music-note Block.—C. J. Costello, Kingston, and John Costello, New York city.
104,834.—Broom.—E. M. Crandal, Marshalltown, Iowa.
104,835.—Dental Pin.—Peter Crans, Jr., (Robert McKinley, Administrator), Philadelphia, Pa.
104,836.—Fireplace Grate.—James A. Crawford, Newcastle, Pa.
104,837.—Hose Coupling.—Charles H. Cushman, Alexandria, Va.
104,838.—Keyhole Escutcheon.—S. W. Drowne, Norwich, Conn.
104,839.—Fruit Jar.—Timothy Earle, Valley Falls, R. I.
104,840.—Breastpin. — Theodore G. Eiswald, Providence, R. I.
104,841.—Cork Presser.—Jas. Ewing, New York city.
104,842.—Hot-air Furnace.—M. G. Fagan (assignor to himself and A. C. Corse) Troy, N. Y.
104,843.—Dry Dock.—G. H. Ferris, Brooklyn, N. Y.
104,844.—Stove Grate.—Lyman Gleason, Milford, Mass.
104,845.—Traction Engine.—Thomas F. Hall, Omaha, Nebraska.
104,846.—Corn Harvester.—George B. Hamlin, Willimantic, Conn.
104,847.—Saw Frame.—Wm. Hankin, Williamsburgh, N. Y., assignor to himself and W. H. Hankin.
104,848.—Safety Dumping Cage for Mines.—W. Z. Hatcher (assignor to himself and W. L. Lance), Plymouth, Pa.
104,849.—Rock Drill.—W. Z. Hatcher and W. L. Lance, Plymouth, Pa.
104,850.—Tobacco-pipe Machine.—J. H. Hollely, Brooklyn, N. Y. Antedated June 17, 1870.
104,851.—Folding Chair.—F. M. Holmes, Boston, Mass.
104,852.—Harvester.—W. B. Johns, Georgetown, D. C., and W. J. Read, Cumberland, Md.
104,853.—Paper-collar Box.—Salomon Kaufmann (assignor to Metropolitan Collar Co.), New York City.
104,854.—Machine for Distributing Fertilizers.—J. F. Keller, Hagerstown, Md.
104,855.—Deep-well Pump.—H. K. Kenyon, Steubenville, Ohio, assignor to himself and Jarecki, Mets & Co.
104,856.—Stem-winding and Hand-setting Watch.—C. L. Kidder and F. A. Jones, Boston, Mass.; said Kidder assigns his right to said Jones. Antedated June 16, 1870.
104,857.—Lantern Guard.—Joseph Kintz, West Meriden, Conn.
104,858.—Securing Veneering to Wood.—W. H. Knight, Boston Highlands, Mass.
104,859.—Call Bell and Slop Bowl.—Nathan Lawrence, Taunton, Mass.
104,860.—Railway Switch.—G. W. Lee and J. A. Lafontaine, Barlow county, and A. L. Harris, Atlanta, Ga.
104,861.—Water-proof Sweat-band for Hats and Caps.—P. F. Lenhart, Brooklyn, N. Y.
104,862.—Compound for Printers' Ink.—H. Loewenberg, New York city.
104,863.—Moving Carriage Top.—O. E. Mallory, Batavia, N. Y.
104,864.—Carpet Fastening.—J. J. Marki (assignor to himself and W. H. Lotz), Chicago, Ill.
104,865.—Construction of Prison Walls.—Edwin May, Indianapolis, Ind.
104,866.—Apparatus for Cleaning Cesspools, Vaults, Privies, etc.—W. C. McCarthy, Pittsburgh, Pa.
104,867.—Bridge.—David McCurdy, Ottawa, Ohio. Antedated June 17, 1870.
104,868.—Bridge.—David McCurdy, Ottawa, Ohio. Antedated June 17, 1870.
104,869.—Bridge.—David McCurdy, Ottawa, Ohio. Antedated June 17, 1870.
104,870.—Mortar Mill.—John McIntyre, Syracuse, N. Y.
104,871.—Sewing Machine.—T. L. Melone, Mount Gilead, Ohio.
104,872.—Wire Cutter.—Edgar Murray, New York city, assignor to Henry Gerecke, Carlstadt, N. J.
104,873.—Manufacture of Steel. — Charles Motier Nes, York, Pa.
104,874.—Tongue Holder for Dentists.—F. M. Osborn, Port Chester, N. Y.
104,875.—Hitching Post. — Josiah Oathoudt, Minneapolis, Minn.
104,876.—Equalizing Bar for Railway Car Trucks.—Addison Overbagh, Scranton, Pa.
104,877.—Umbrella.—T. B. Penicks, Philadelphia, Pa., and Joseph Heffly, Washington, D. C.
104,878.—Machine for Cutting Fat, etc.—Adolph Pfaff, Baltimore, Md.
104,879.—Composition Amalgam for Filling Teeth.—L. A. Plumb, Boston, Mass.
104,880.—Faucet.—A. D. Puffer, Boston, Mass.
104,881.—Soda Fountain.—A. D. Puffer, Boston, Mass.
104,882.—Sorghum Stripper.—D. A. Reid, Wayne township, Ind.
104,883.—Harvester Attachment for Raking and Binding Grain.—H. A. Reid, Beaver Dam, Wis.
104,884.—Shaft Coupling.—P. W. Reinshagen, Cincinnati, Ohio.
104,885.—Coal Scuttle.—Henry S. Reynolds, New York city.
104,886.—Scrubber and Cleaner.—Wm. G. Rhodehamel, Piqua, Ohio.
104,887.—Machine for Making Composition Roofing.—I. L. G. Rice, Cambridge, Mass.
104,888.—Steam Road Vehicle.—Ira A. Sabin, Locust Lane, Pa.
104,889.—Stovepipe Damper.—David Saunders (assignor to himself and J. D. Pierse), Milwaukee, Wis.
104,890.—Shelving for Stores.—W. E. Scott, Knoxville, Tenn.
104,891.—Horse Hay Fork.—Geo. W. Shade, Shippensburg, Pa.
104,892.—Sash Holder.—Nathan Y. Shaw, Greenville, N.Y.
104,893.—Cotton-Seed Sower.—Joseph Shearer, Timberville, Ill.
104,894.—Scale for Laying out Shoe Patterns.—Wm. Sheill, Dayton, Ohio.
104,895.—Feed Attachment for Thrashing Machines.—D. F. Slane, Chillicothe, Ohio.
104,896.—Animal Trap.—Elonzo Sprague and Geo. C. Belt, Bridgeton, Ind.
104,897.—Car Brake.—Joseph Steger, New York city.
104,898.—Lamp Shade Holder.—Cornelius St. John, New York city, assignor to himself and James E. Underhill.
104,899.—Lifting Handles for Coffins, etc.—T. M. Taylor, New York city, assignor to the Meriden Britannia Company, Meriden, Conn.
104,900.—Device for Operating Awnings. — Andrew Thalhofer, South Bend, Ind.
104,901.—Axle Nut and Axle.—Chauncey Thomas, Boston, Mass.
104,902.—Iron Bridge. — Lucius E. Truesdell, Warren, Mass.
104,903.—Tassel Hook.—Elisha Turner, Wolcottville, Conn.
104,904.—Method of Manufacturing Axle Nuts.—Sam'l Vanstone, Providence, R. I.
104,905.—Wrought-Iron Coupling Pipe.—Samuel Vanstone, Providence, R. I.
104,906.—School Desk Seat.—A. S. Vorse, Des Moines, Iowa.
104,907.—Railway Car Spring.—Richard Vorse, New York city.
104,908.—Manufacture of Cast Pipe Elbows.—John G. Weaver, Jr., Cincinnati, Ohio.
104,909.—Combined Piston Head and Valve.—George Weinmann, Columbia, Ohio.
104,910.—Breaking Machine.—James Davenport Whelpley, Boston, Mass.
104,911.—Window for Coal Stove.—Alex. White, Geneseo, Ill.
104,912.—Cartridge.—Nathaniel Gilbert Whitmore, Mansfield, Mass., assignor to himself and Alfred A. Reed, Jr., Providence, R. I.
104,913.—Pipe Wrench.—J. A. Wilcox, Rocky Hill, assign- to himself and W. S. Wilcox, Hartford, Conn.
104,914.—Impermeator for Steam Engines.—Henry Wilson, Stockton-on-Tees, Great Britain.
104,915.—Tool for Driving Glaziers' Points.—Alfred Woodworth and E. W. Warren, Cambridge, N. Y.
104,916—Preserving Wood.—A. B. Tripler, New Orleans, La.
104,917.—Preserving Wood for Railroad Ties and for other Purposes.—A. B. Tripler, New Orleans, La.
104,918.—Wind Wheel.—Charles H. St. Clair, New Orleans, La.
104,919.—Strawberry Huller.—Julia W. D. Patten, Washington, D. C.

REISSUES.

4,044.—Spider Arch for Burning Bagasse.—John Amick, Ascension parish, La.—Patent No. 101,966, dated April 19, 1870.
4,045.—Non-Corrosive Valve Seat.—E. H. Ashcroft, Lynn, Mass.—Patent No. 81,576, dated Sept. 1, 1868.
4,046.—Corn Marker, Planter, and Cultivator.—Elias Barto, Tiffin, Ohio.—Patent No. 89,843, dated May 11, 1869.
4,047.—Cotton Gin.—J. C. Du Bois, Millerton, Cal., assignee of John Du Bois.—Patent No. 20,051, dated April 27, 1858.
4,048.—Preventing the Corrosion of Iron Exposed to Water or Dampness.—Cornelius Godfrey, New York city, and Reuben Lighthall, Brooklyn, N. Y., assignees of Reuben Lighthall.—Patent No. 97,657, dated Dec. 7, 1869.
4,049.—Water Indicator for Boilers.—John D. Lynde, Philadelphia, Pa.—Patent No. 74,389, dated Feb. 11, 1868.
4,050.—Apparatus for Filling Bottles.—H. W. Putnam, Bennington, Vt.—Patent No. 33,602, dated Oct. 29, 1861.
4,051.—Vinegar Apparatus.—A. B. Strong, Ashtabula, Ohio.—Patent No. 97,967, dated Dec. 14, 1869.
4,052.—Division A.—Fertilizer.—D. A. Ter Hoeven, Philadelphia, Pa.—Patent No. 79,160, dated June 23, 1868.
4,053.—Division B.—Manufacture of Fertilizers.—D. A. Ter Hoeven, Philadelphia, Pa.—Patent No. 79,160, dated June 23, 1868.
4,054.—Faucet.—Wm. H. Trissler, Cleveland, Ohio.—Patent No. 102,624, dated May 3, 1870.
4,055.—Division A.—Oven.—Joseph Vale, Beloit, Wis.—Patent No. 79,615, dated July 7, 1868; reissue 3,796, dated January 11, 1870.
4,056.—Division B.—Oven. — Joseph Vale, Beloit, Wis.—Patent No. 79,615, dated July 7, 1868; reissue 3,769, dated January 11, 1870.

DESIGNS.

4,174.—Paper Box.—J. C. Bauer, New York city.
4,175.—Ornamentation of Dishes.—E. Bennett, Baltimore, Md.
4,176 and 4,177.—Carpet Pattern.—Hugh Christie, Morrisania, N. Y., assignor to Israel Foster, Philadelphia, Pa. Two Patents.
4,178.—Trade Mark.—Henry Fletcher (assignor to Fletcher Manufacturing Co.), Providence, R. I.
4,179.—Fur Collar.—John H. Kappelhoff and Samuel Rauh, New York city.
4,180 and 4,181.—Carpet Pattern.—William Kerr (assignor to Israel Foster), Philadelphia, Pa. Two Patents.
4,182.—Trade Mark.—Martin Landenberger, Philadelphia, Pa.
4,183.—Cooking Stove.—Peter Low, Cleveland, Ohio.
4,184.—Gate.—Samuel Macferran and Elhanan Omensetter, Philadelphia, Pa., assignors to Samuel Macferran.
4,185.—Sash Holder.—J. H. Martin, Salem, N. Y.
4,186.—Trade Mark.—Martin Landenberger, Philadelphia, Pa.
4,187.—Statuette.—Nicholas Mueller, New York city.
4,188.—Pair of Statuettes.—Nicholas Mueller, New York city.
4,189 to 4,195.—Iron Railing.—Elhanan Omensetter (assignor to Samuel Macferran), Philadelphia, Pa. Seven Patents.
4,196.—Railing.—Elhanan Omensetter (assignor to Samuel Macferran,) Philadelphia, Pa.
4,197.—Mold Board.—J. T. Wilson, Rochester, N. Y.

EXTENSIONS.

Non-Elastic Bands for Bales of Cotton and other Fibrous Materials.—Mary Ann McComb, of Memphis, Tenn., administratrix of David McComb, deceased.—Letters Patent No. 15,142, dated June 17, 1856.

Attaching Pads to Saddle-Trees.—James Ives, of Mount Carmel, Conn.—Letters Patent No. 15,077, dated June 10, 1856.

Cartridge.—Edward Maynard, of Washington, D. C.—Letters Patent No. 15,141, dated June 17, 1865.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Machinery for Combing Wool.—Michael H. Simpson, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing Aug. 31, 1870.

Manufacture of Iron and Steel.—Robert Mushet, Cheltenham, England, has petitioned for an extension of the above patent. Day of hearing Sept. 7, 1870.

Ovens.—Hosea Ball, New York city, has applied for an extension of the above patent. Day of hearing Sept. 7, 1870.

Machine for Notching Hoops.—Emily J. Lamson, of Weymouth, Mass., executrix of Daniel Lamson, deceased, has petitioned for the extension of the above patent. Day of hearing Sept. 7, 1870.

NEW BOOKS AND PUBLICATIONS.

The American Annual Cyclopædia and Register of Important Events of the Year 1869, embracing Political, Civil, Military, and Social Affairs; Public Documents, Biography, Statistics, Commerce, Finance, Literature, Science, Agriculture, and Mechanical Industry. Volume IX. New York: D. Appleton & Company, 90, 92, and 94 Grand street.

This volume of a popular and well-known work, published annually, is of the usual size, and filled as usual with a large store of useful information. It is impossible that we should notice all the contents, but we observe that under the head of "Astronomical Phenomena and Progress," a very full account is given of the phenomena observed at different points during the eclipse of August 7, 1869. This department also contains a record of other interesting and important matters. The department of chemistry is not very complete, but contains some interesting articles and some useful practical applications of a novel kind. Of special interest are the articles on "Ammonium Amalgam," and the "Purification of Water by Chemical Ingredients." Under the head of "Metals," the most recent processes of manufacturing iron and steel are noticed. We find little or nothing upon engineering or mechanical industry. The tables and statistics are compiled with the usual care bestowed upon these things in this publication, and constitute the chief value of the present volume.

The New Elements of Hand Railing. In Concise Problems, calculated to bring this most Useful Science within the reach of every capacity. By Robert Riddell, Author of "The Carpenter and Joiner," "Hand-Railing Simplified," etc. Illustrated with Forty Accurate Plates. Philadelphia: Claxton, Remsen & Haffelfinger. London: Sampson, Low & Co.

This is a large quarto—beautifully printed, illustrated, and bound—by a well-known, able, and popular writer who fully understands the subject he treats, and possesses the rare faculty of expressing himself with perfect clearness. The book is a valuable addition to technical literature, and will prove of great value to carpenters and builders.

Trans-Continental Tourists' Guide, Containing a Full and Authentic Description of over Five Hundred Cities, Towns, Villages, Stations, Mountains, Lakes, Rivers, Sulphur, Soda, and Hot Springs, Scenery, Watering Places Summer Resorts; where to look for and Hunt the Buffalo, Antelope, Deer, and Trout Fishing, etc., along the line of the Union Pacific Railroad, and Central Pacific Railroad, of California, their Branches and Connections by Stage and Water, from the Atlantic to the Pacific Ocean. Illustrated. New York: George A. Crofutt & Co., Publishers, No. 21 Park Row.

RECEIPTS—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

MECHANICAL ENGRAVINGS,

Such as embellish the **SCIENTIFIC AMERICAN,** are generally superior to those of any similar publication, either in this country or in Europe. They are prepared by our own artists, who have had long experience in this branch of art, and who work exclusively for us. The cost of a first-class engraving, done by our own artists, and printed in one issue of the **Scientific American,** will amount to less than one-half the sum that would have to be expended on a poor illustration, printed in the same number of circulars, and on a sheet of paper in size equal to one page of our journal. A printed handbill has no permanent value. Thousands of volumes of the **Scientific American** are bound and preserved for future reference—besides, we estimate that every issue of our paper is read by no fewer than one hundred thousand persons.

To Advertisers.

All good business men, before spending their money upon advertising, are in the habit of inquiring about the character and extent of circulation enjoyed by the journal that solicits their patronage. In this respect the publishers of the **Scientific American** challenge the closest scrutiny—the fact will show that their terms are much lower than those of any other journal of the same class in proportion to the extent of circulation.

Parties who desire to have their machines illustrated can address the undersigned, who are also prepared to send artists to make sketches of manufacturing establishments, with a view to their publication in the **Scientific American.**

MUNN & CO.,
37 Park Row, New York.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known, to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - $1.00 a line.
Inside Page - - - - - 75 cents a line.
Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

$15 For the BEST SAW GUMMER out. Address THE TANITE CO., Stroudsburg, Pa.

MONEY Easily made with our Stencil and Key-Check Outfit. ☞ Circulars Free. STAFFORD M'F'G CO., 66 Fulton st., N.Y.

MONEY. Tinners, Farmers, & Merchants who want to make money, address, with stamp, A. T. Sinker, Indianapolis, Ind.

HUDSON RIVER INSTITUTE AND CLAVERACK COLLEGE.—A 1st-class Boarding School for both sexes. College course for ladies, and academic course for ladies and gentlemen. Nine departments and sixteen professors and teachers. Board and tuition in eight departments $300 per year. Instrumental music extra. Term opens Sept. 5. Rev. ALONZO FLACK, A.M., President, Claverack, Col. Co., N. Y.

Grinding and Bolting

MILLS—For grain & all substances, ground and bolted. Bolt within the mill casing, and the bolting instantaneous with the grinding. Capacity of flour mill 3 feet by 4—a barrel and a half per hour. Corn Mills, with vertical and horizontal spindles. Over 2,000 sold. EDWARD HARRISON, New Haven, Conn.

HINKLEY KNITTING MACHINE

FOR Family Use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me., or 176 Broadway, N.Y.

PORTABLE Steam Engine & Boiler, complete:

4-Horse Power	$ 550
6 " "	670
8 " "	780
12 " "	1,000
15 " "	1,100
20 " "	1,500
25 " "	1,800

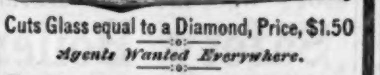
STATIONARY Steam Engine, without Boiler:

4-Horse Power	$220
6 " "	250
8 " "	325
15 " "	425
25 " "	675

☞ Send for Illustrated circular.

For Sale by H. B. BIGELOW & CO., New Haven, Conn.

Excelsior Glass Cutter.



Cuts Glass equal to a Diamond, Price, $1.50

Agents Wanted Everywhere.

E. D. & W. A. FRENCH,
Cor. Third and Vine Sts., Camden, N. J.

THE BODINE
Jonval Turbine
WATER WHEEL

Warranted to exceed any Iron wheel by 50 per cent. This wheel was tested at Lowell, in 1869, by Mr. H. F. Mills, C.E., and his report of the test is now ready. Apply to G. L. LAFLIN, Treasurer, Westfield, Mass., Or Bodine M'f'g Co., Mount Morris, N. Y.

Buy Barber's Bit Brace.

WOOD-WORKING MACHINERY GENerally. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass. Warerooms 42 Courtlandt st., New York. WITHERBY RUGG, & RICHARDSON.

BURDON IRON WORKS,—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines of all kinds, Sugar Mills, Screw, Lever, Drop & Hydraulic Presses, Machinery in general. Hubbard & Whittaker, 102 Front st., Brooklyn.

RIDER'S

AUTOMATIC CUT-OFF
Vertical Engines,
MANUFACTURED BY THE
Albany st. Iron Works,
New York.

These Engines are simple, compact, and durable, and in point of economy of fuel and space, are excelled by none, and are cheaper than any other first-class cut-off Engines in the market.

Descriptive Pamphlets & Price lists mailed free on application to the proprietors.

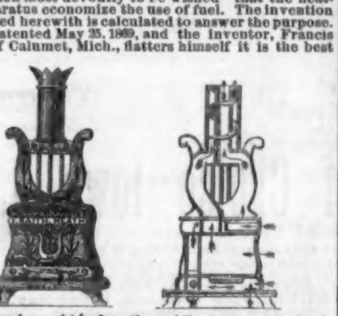
Handren & Ripley,
CORNER
Albany & Washington sts., New York.

For Sale.

ONE LARGE INDEX and THREE COMmon Milling Machines. Have been in use a short time, but are in good order. Have also on hand first-class Machinists' Tools. Prices low. POST & CO., 119, 121, and 123 West Front st., Cincinnati, Ohio.

Economy is Wealth.

AT THE PRESENT DAY, WHEN WOOD and coal command such high prices, "it is a consummation most devoutly to be wished" that the heating apparatus economize the use of fuel. The invention illustrated herewith is calculated to answer the purpose. It was patented May 25, 1869, and the inventor, Francis Raith, of Calumet, Mich., flatters himself it is the best



stove ever brought before the public to generate heat, diffuse it over the room, and lessen the consumption of fuel, either coal or wood. He claims it will save 40 per cent of fuel, and hesitates not in saying it will save 50 per cent more than the ordinary stoves now in use. The old complaint "it is hot near the stove but cold by the windows" will not be heard by using this stove.

The inventor is desirous of inducing manufacturers to take hold of the apparatus and supply the great demand which must arise from its fuel-saving qualities.

He is willing to grant State rights to manufacturers, and to sell the first right at a very moderate price.

Model makers will receive prompt attention by addressing FRANCIS RAITH, Box 202, Calumet, Houghton City, Michigan.

Valuable Books
FOR
Architects & Builders.

Bullock—The American Cottage Builder: A Series of Designs, Plans, and Specifications, from $200 to $20,000 for Homes for the People; together with Warming, Ventilation, Drainage, Painting, and Landscape Gardening. By John Bullock, Architect, Civil Engineer, Mechanician, and Editor of "The Rudiments of Architecture and Building," etc. Illustrated by 75 engravings. In one volume. 8vo. $3.50

Bullock—The Rudiments of Architecture and Building: For the use of Architects, Builders, Draftsmen, Machinists, Engineers, and Mechanics. Edited by John Bullock, author of "The American Cottage Builder." Illustrated by 250 engravings. In 1 vol., 8vo. $2.50

Blenkarn.—Practical Specifications of Works Executed in Architecture, Civil and Mechanical Engineering, and in Road Making and Sewerage: To which are added a series of practically useful Agreements and Reports. By John Blenkarn. Illustrated by fifteen large folding plates. 8vo. $9.00

Clough.—The Contractor's Manual and Builder's Price Book: By A. B. Clough, Architect. 24mo, cloth ....75c.

De Graff.—The Geometrical Stair Builders' Guide: Being a Plain, Practical System of Hand-Railing, embracing all its necessary Details, and Geometrically Illustrated by 22 Steel Engravings: together with the use of the most approved principles of Practical Geometry. By Simon De Graff, Architect. 4to. $5.00

Hurst.—A Hand-Book for Architectural Surveyors: Comprising Formulæ useful in Designing Builder's work, Table of Weights, of the materials used in Building, Memoranda connected with Builders' work, Mensuration, the Practice of Builders' Measurement, Contracts of Labor, Valuation of Property, Summary of the Practice in Dilapidation, etc., etc. By J. F. Hurst, C. E. Second edition, pocket-book form. Full bound. $2.50

Shaw.—Civil Architecture: Being A Complete Theoretical and Practical System of Building, containing the Fundamental Principles of the Art. By Edward Shaw, Architect. To which is added a Treatise on Gothic Architecture, etc. By Thomas W. Silloway and George M. Harding, Architects. The whole illustrated by 102 quarto plates finely engraved on copper. Eleventh edition. 4to. Cloth. $10.00

Sloan.—American Houses: A variety of Original Designs for Rural Buildings. Illustrated by 26 Colored Engravings, with Descriptive References. By Samuel Sloan, Architect, author of the "Model Architect," etc., etc. 8vo. $2.50

Smeaton—Builder's Pocket Companion: Containing the Elements of Building, Surveying, and Architecture; with Practical Rules and Instructions connected with the subject. By A. C. Smeaton, Civil Engineer, etc. 1 vol. 12mo. $1.50

☞ The above, or any of my Books, sent by mail, free of postage, at the publication price. My new and enlarged Catalogue of PRACTICAL AND SCIENTIFIC BOOKS, 82 pages, 8vo., now ready, complete to June 1, 1870, will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD,
Industrial Publisher, 406 Walnut St.
PHILADELPHIA.

Small Engine Lathes,

And every description of small Lathes, with Foot Motion. Also, Brass Finishing Lathes and Tools, made by EXETER MACHINE WORKS, Exeter, N. H.

U. S. PIANO CO. N.Y. $290. FOR 1st CLASS 7 OCT. SENT ON TRIAL—CIRCULARS MAILED FREE.

L. W. Pond's New Tools.

NEW AND IMPROVED PATTERNS—Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters Punches and Shears for Iron. Dealer in

MACHINERY.

Works at Worcester, Mass. Office, 98 Liberty st., N. Y. S. N. HARTWELL, General Agent.

Wheel Machinery

Of every description made by EXETER MACHINE WORKS, Exeter, N. H.

Andrews' Patents.

Noiseless, Friction Grooved, Portable, and Warehouse Hoisters; Friction or Geared Mining & Quarry Hoisters; Smoke-Burning Safety Boilers. Oscillating Engines, Double and Single, half to 100-Horse power. Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury. All Light, Simple, Durable, and Economical. Send for Circulars.

WM. D. ANDREWS, ANDREWS & BRO., 414 Water street, New York.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057, Boston, Mass.

N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

WANTED—AGENTS—To sell the OCTAGON SEWING MACHINE. It is licensed, makes the "Elastic Lock Stitch," and is warranted for 5 years. Price $15. All other machines, with an under feed, sold for $15, or less, are infringements. Address OCTAGON SEWING MACHINE CO., St. Louis, Mo.; Chicago, Ill.; Pittsburgh, Pa.; or Boston, Mass.

LATHE CHUCKS—HORTON'S PATENT—from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON Windsor Locks Conn

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa.

CAMDEN
Tool and Tube Works,

Camden, N. J. Manufacturers of Wrought Iron Tube, and all the most improved TOOLS for screwing, Cutting, and Fitting Pipe Tube and Oil Well Casing. Screwing Machines of different sizes to screw and cut off from the largest to the smallest sized Pipe or Casing. Peace's Patent Adjustable Pipe Cutter, No. 2 cuts off from ⅛ to 2 Pipe, $9.00. Peace's Pat. Screwing Stocks and Dies, No. 1 Screws ¼, ⅜, ½, ¾, $10. No. 2 screws 1, 1¼, 1½, 2 pipe, $20. No. 3 both screws and cuts off, 2½, 3, 3½, 4, $65.

PATENTEES

Who have failed in their efforts to dispose of their rights will do well to consult us, either personally or by mail, free of charge. Many valuable inventions are lying dormant, for want of proper management, that might realize a fortune for their owners, if placed in our hands, and brought to the attention of capitalists. Only those will be accepted which we feel satisfied can be sold, as our object is solely the realization of a commission. A candid opinion can therefore be relied upon. No charge for services unless successful. References on application. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall st., New York.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels Churches, Factories, & Public Buildings, Heated by Steam Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st.) N. Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't

Niagara Steam Pump.

CHAS. B. HARDICK, No. 9 Adams st., Brooklyn, N. Y.

THE BEST PUNCHING PRESSES ARE made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES, Middletown, Conn.

OAK TANNED
LEATHER BELTING,
Manufactured by ....C. W. ARNY. 301 and 303 Cherry st., Philadelphia.

WANTED AGENTS—To sell the HOME SHUTTLE SEWING MACHINE. Price $25. It makes the "Lock Stitch" (alike on both sides) and is the only licensed under-feed Shuttle Machine sold for less than $60. Licensed by Wheeler & Wilson, Grover & Baker, and Singer & Co. All other under-feed Shuttle Machines sold for less than $60 are infringements, and the seller and user liable to prosecution. Address JOHNSON, CLARK & CO., Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill., or St. Louis, Mo.

KINDLEBERGER DOUBLE TURBINES The most economical Water Wheel of its class Manufactured and sold by NILES WORKS, Cincinnati, Ohio.

J. P. GROSVENOR'S
PATENT ADJUSTABLE
Circular Saw Benches,
AND PATENT IMPROVED
VARIETY MOLDING MACHINES,

And Wood-working Machinery in general, manufactory at Lowell, Mass., salesroom 91 Liberty st., New York city.

1832. SCHENCK'S PATENT 1870.
Woodworth Planers.

And Re-sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK & SON, Matteawan, N. Y., and 118 Liberty st., New York.

PATENT BANDSAW MACHINES of the most improved kinds, of various sizes, by FIRST & PRYIBIL, 452-456 Tenth ave., New York. Price $250, $275, $350. At present (March 28), there are in operation, in this city alone, 78 of our Machines. ☞ Send for Circular.

OTIS' SAFETY HOISTING *Machinery.*
OTIS BROTHERS & CO.
NO. 309 BROADWAY, NEW YORK.

SHINGLE AND HEADING MACHINE—Law's Patent with Trevor & Co.'s Improvements The Simplest and Best in use. Also, Shingle, Heading, and Stave Jointers, Equalizers, Heading Turners, Planers etc. Address TREVOR & CO., Lockport, N. Y.

CINCINNATI BRASS WORKS.—Engineers' and Steam Fitters' Brass Work. Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r.

VINEGAR.—How Made from Cider, Wine Molasses, or Sorghum in 10 hours, without using drugs. For circulars, address F. I. SAGE, Vinegar Maker, Cromwell Conn.

WOODBURY'S PATENT
Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery. S. A. WOODS, 91 Liberty street, N. Y.; Send for Circulars. 67 Sudbury street, Boston

WATER-FLAME LIME KILN—BEST IN THE WORLD. Rights for sale. C. D. PAGE, Rochester, N. Y.

THE MERRIMAN PATENT BOLT CUTTERS—Unrivaled by any. Cuts V, half-V, square, or round threads, on any size bolt, at one cut, with revolving dies that are instantly adjusted to the slightest variation, and opened to release the bolt when cut. The dies are changeable without turning a nut or screw Send for illustrated circular. BROWN & BARNES, Fair Haven (near New Haven), Conn.

$250 A Month with Stencil & Key Check Dies. Don't fail to secure Circular and Samples free. Address S. M. SPENCER, Brattleboro, Vt.

GREAT ECONOMY
IN COOKING.

MITCHELL'S Combination Cooking Stove cooks, bakes and steams everything. Heats flats, broils steak, no heat in your house in Summer. Eight cents worth of fuel lasts six hours. Stove (including Teakettle), eight dollars, oven $4, steamer $1.

Boxed and shipped on receipt of Price. The Trade supplied at a discount. State and County Rights for sale. Address H. B. MITCHELL, Chicago, Ill.

Send for Circular.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS. 602 Cherry st., Philadelphia, Pa.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **750** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address J. C. HOADLEY & CO Lawrence Mass.

IMPORTANT

TO MACHINISTS.—The Best Metal for all Machine Uses is the MARTIN STEEL, made by THE NEW JERSEY STEEL AND IRON CO., Trenton, N. J. This steel is made by an entirely different process from any other, and is tougher than wrought iron. It can be turned without annealing, being entirely free from hard spots. Every one who uses it pronounces it just what they have long wanted, for a multitude of uses, such as Crank Pins, Lathe Spindles and Screws, Cotton Machinery Rollers, Saw and Fan Spindles, etc., etc. Also, particularly adapted for Firebox Plates. Prices Low. Send for further information, or a sample, stating use to which it is to be applied.

RIFLES, SHOT GUNS, REVOLVERS, etc., at reduced prices, warranted and sent by express, C.O.D., to be examined before paid for. Liberal terms to the Trade, Agents, or Clubs. Write for a price catalogue. Address GREAT WESTERN GUN WORKS, 179 Smithfield st., Pittsburgh, Pa.
N. B.—Army Guns, Revolvers, etc., bought or traded or

STEERE'S PAT. SELF-LUBRICATING Spindle Bolsters. 600,000 now in use. Parties, before ordering new Spinning Machinery, or making repairs on the old, will please send for circulars giving full particulars. ERASTUS N. STEERE, No. 10 Market Square, Providence, R. I.

THE GENUINE
CONCORD WAGON AXLES.
Manufactured by
D. ARTHUR BROWN & CO.,
Fisherville (Concord), N. H.
Send for circular and price list.

TRANSMISSION OF POWER BY
WIRE ROPE.

PLANS prepared and WORK executed. WIRE ROPES For Sale. C. W. COPELAND, No. 64 Broadway.

NOTICE.

ALL PARTIES USING WOOD-BENDING Machinery, in the United States, that bends lengths from or toward the center, or that bends curves in different planes, or angular to each other, can only be authorized to do so legally by the Morris-Heywood Timber Bending Co., under their several Patents. For particulars, address S. M. BARRETT, Pres't, Sheboygan, Wis. JOHN C. MORRIS, Sec., Cincinnati, Ohio.

Safety Hoisting Gear,
PATENTED AND MADE BY
MERRICK & SONS,
Philadelphia, Pa.

$3.—THE AMERICAN BUILDER—One of the most valuable monthly publications of the day. Send $3 for the BUILDER, and get in addition the splendid premium of Ritchie's Irving, a fine steel engraving, size 24x32. CHAS. D. LAKEY, Publisher, 151 and 153 Monroe st., Chicago.

MULTIPLYING PRESSURE
FAN BLOWERS.
The Rahway M'f'g Co., ...Rahway, N. J

TO PATENTEES.
The St. Cloud Hotel,

Corner 9th and F sts., Washington, D. C., **Opposite Patent Office and Masonic Temple, and** One Block from GENERAL POSTOFFICE DEPARTMENT. The F street cars, communicating with the Capitol, Executive Mansion, Treasury, War, and Navy Departments, and the B. and O. R. R. Depot, pass the door. MRS. E. A. POLLARD, Proprietress.

WATER WHEELS.

Greatly improved test Turbines. Send for circular. GEO. T. McLAUTHLIN & CO., Boston, U. S. A.

Subscribers—who wish to have their volumes bound, can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Advertisements.

Advertisements will be admitted on this page at the rate of $1·00 per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

$15 For the BEST SAW GUMMER out. Address THE TANITE CO., Stroudsburg, Pa.

A. L. WEBSTER,—114 Fulton st., New York, Manufacturer of, and Wholesale Dealer in Webster's Patent Oil Cans, etc. Also, dealer in refined Petroleum.

EMPLOYMENT.
$250 A MONTH with Stencil Dies. Samples free. Address S. M. SPENCER, Brattleboro, Vt.

Niles Tool Works,
CINCINNATI, OHIO.

MACHINISTS' TOOLS OF THE BEST description, at reasonable prices.

Gaff, Gray & Gordon
Have purchased the entire interest of the
NILES WORKS,
in this branch of their business, and will continue the manufacture of
MACHINISTS' TOOLS,
with increased facilities.
IRON-WORKING MACHINERY
is a SPECIALTY with us.

American Saw Co., Manufacturers of

And Perforated Circular, Long, and Hand Saws. Also Solid Saws of all kinds. No 1 Ferry st., cor. Gold st., New York. Branch Office for Pacific coast, No. 606 Front st., San Francisco, Cal.

ERICSSON'S
Caloric Engine.

SAFE, ECONOMICAL, DURABLE. USES NO WATER. REQUIRES NO ENGINEER.

Having made arrangements for manufacturing this Engine on an extensive scale, we are now prepared to furnish to all desiring a light power, the best and most economical engine ever offered to the public.
DELAMATER IRON WORKS,
Foot of West 13th st., New York.
Branch Office:—JAS. A. ROBINSON, 130 Broadway.

GREAT IMPROVEMENT IN CRUSHING and Grinding. To Miners, Ironmasters, Manufacturing Chemists, Superphosphate Makers, Bone Grinders, Dyewood Workers, etc., etc.—E. P. BAUGH'S Patent Sectional Crushing and Grinding Mills, for reducing to powder rocks, ores, slag, bones, logwoods, and all kinds of mineral guano, and other tough and hard substances. For illustrated circular address BAUGH & SONS, 20 S. Delaware ave., Philadelphia.

THE CELEBRATED
Cold Rolled Shafting.

THIS SHAFTING IS IN EVERY PARticular Superior to any turned shafting ever made. It is the most economical shafting to buy, being so very much stronger than turned shafting, less diameter answers every purpose, causing a great saving in couplings, pulleys, and hangers. It is perfectly round, and made to Whitworth's Gage. All who give it a trial, continue to use it exclusively. We have it in large quantities. Call and examine it, or send for a price list. GEO. PLACE & CO., 126 and 128 Chambers st., New York.

$2,000 a year & Expenses
to agents to sell the celebrated WILSON SEWING MACHINES. The best machine in the world. Stitch alike on both sides. One Machine Without Money. For further particulars, address
THE WILSON SEWING MACHINE CO.,
Cleveland, Ohio, Boston, Mass., or St. Louis, Mo.

PURE CHEMICALS, ACIDS, DRUGS, Minerals, Ores, and Oils, manufactured for all trades, L. & J. W. FEUCHTWANGER, Importers of Chemicals and Drugs, and Manufacturing Chemists, No 55 Cedar st., New York.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 1

CIRCULAR SAW MILLS, Planers, Matchers, etc., made by S. HEALD & SONS, Barre, Mass

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn. 5 tf os

Reynolds' Turbine Water Wheels.
The Oldest and Newest. All others only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch reliable, economical power. Beautiful pamphlet free. GEO. TALLCOT, 16 Liberty st., New York.
Gearing Shafting.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery. Models for the Patent Office, built to order by HOLSKE MACHINE CO., Nos. 528, 530, and 532 Water st., near Jefferson. Refer to Scientific American office. 14 tf

TO SURVEYORS.
PRICES FOR 1870.

ENGINEERS' TRANSIT	$170
" Y-LEVEL	$105
SIX-INCH VERNIER COMPASS	$45

Best quality only. Circulars sent free.
BLUNT & CO., 179 Water st., New York.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

PATTERN LETTERS KNIGHT BROS

AT
Greatly Reduced Prices
Drawing Instruments of every description, Transits, Levels, Compasses, Chains, Tape Measures, Drawing Papers and Materials.
JAMES W. QUEEN & CO.,
924 Chestnut st., Philadelphia Pa.
☞ A Manual and Catalogue sent on application.

WOOD & MANN PORTABLE AND Stationary Engines are equal to the best, and cheaper than those of any other first-class maker. Hoisting Engines, Saw Mills, and Burr Mills.
Send for reduced price list.
WAREROOMS
42 Cortlandt street New York

RANSOM
SIPHON CONDENSER CO.,
Buffalo, N.Y. Condenser illustrated in Scientific American, Feb. 12. Makes vacuum at 1 per cent cost of power gained. Saves 25 to 40 per c. fuel. Licenses on reasonable terms. Send for circulars.

Working Models
And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER 62 Center st., N. Y

IRON STEAMSHIP BUILDERS.
NEAFIE & LEVY,
PENN WORKS,
MARINE ENGINES, BOILERS, ETC.,
PHILADELPHIA, PA.

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 783 South 2d st., Philadelphia, Pa.

SHAW & JUSTICE'S DEAD STROKE
POWER HAMMERS,
For heavy or light forging and die work. Superior to any others. Durable and simple. P. S. JUSTICE, 4 North 5th st., Philadelphia. 42 Cliff st., New York.

NEW-YORK
Belting & Packing Company,
The oldest and largest Manufacturers of
VULCANIZED
RUBBER FABRICS
ADAPTED TO
Mechanical Purposes.

Machine Belting,
Steam Packing,
Leading Hose,
Suction Hose, Etc.,
Of every size and variety.

PATENT
SOLID EMERY VULCANITE
WHEELS,
For Grinding and Polishing Metals. These Wheels were patented in 1859, and are the ORIGINAL SOLID EMERY WHEELS, of which all other kinds are mere imitations, and greatly inferior.
☞ Descriptive Pamphlets, containing Prices and full information, may be obtained, by mail or otherwise, on application to
NEW-YORK BELTING AND PACKING CO.,
37 & 38 Park Row, New-York.

One Million Acres of Choice Iowa Lands

FOR SALE AT $3 PER ACRE, and upward, for cash, or on credit, by the Iowa Railroad Land Co. Railroads already built through the Lands, and on all sides of them. Great inducements to settlers. Send for our free Pamphlet. It gives prices, terms, location; tells who should come West, what they should bring, what it will cost; gives plans and elevations of 18 different styles of ready-made houses, which the Company furnish at from $250 to $4,000, ready to set up. Maps sent if desired. Address
W. W. WALKER, Vice President, Cedar Rapids, Iowa.

PATENT
COLD ROLLED
SHAFTING.

The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the Celebrated Collins Pat. Coupling, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to JONES & LAUGHLINS, 120 Water st., Pittsburgh, Pa.
☞ Stocks of this shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. GEO. PLACE & CO., 126 Chambers st., New York.

London.......................48 Cannon street.
H. KOHNSTAMM,
Manufacturer of
ULTRAMARINE,
And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 100 Chambers street, between Broadway and Church st., New York.

Improved Awning.

COMMUNICATIONS concerning purchase of Rights should be addressed to J. B. ARMSTRONG, Urbana, Ohio.
It obviates the necessity for posts or supports at the front edge, provides a neat and effective shelter for the awning when rolled up, is perfectly easy to spread out or roll up, is simple in construction, and remarkably tasteful in appearance. It can be fully or partially extended to admit or exclude light without the aid of a step ladder, and in a moment's time. We consider this form of Awning as far superior to any form of canvas awning heretofore employed, combining, as it does, durability, convenience, and comeliness. On exhibition at Whitlock's, Nos. 35 and 37 Park Place, New York. See Scientific American dated Nov. 27, 1869.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

SILICATE OF SODA,
SOLUBLE GLASS, or Water Glass,
Manufactured by L. & J. W. FEUCHTWANGER, Chemists, 55 Cedar st., New York.

AGENTS WANTED—($10 Per Day)—by the AMERICAN KNITTING MACHINE CO., Boston, Mass., or St. Louis, Mo.

TO INVENTORS.
The undersigned, having superior facilities for introducing improvements of merit, and procuring capital for the same, offer their services to Inventors and Patentees. GERNER & TYLER, Civil and Mechanical Engineers, 258 Broadway, New York. P. O. Box 4544.

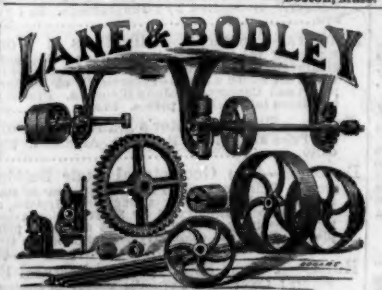
WIRE ROPE.
JOHN A. ROEBLING'S SONS,
Manufacturers, Trenton, N. J.
FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays or Guys on Derricks & Cranes. Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty st.

Prices Reduced.

LEFFEL'S
DOUBLE
TURBINE
Best Water Wheel in existence. Send for New Price List, adopted June 1, 1870. Also, for large wheel book for 1870, just out. Sent free by addressing the manufacturers,
JAMES LEFFEL & CO.,
Springfield, Ohio,
and New Haven, Conn.

$5 For Barnes' Cast Steel and Wrought Iron Self-adjustable Pipe and Stud Wrench, for various sizes. Address C. TRESSELT, Fort Wayne, Ind.

WATER WHEELS.
WARREN'S NEW GRADUATING TURBINE.—If you would be convinced that almost perfection in Water Wheels has been reached, send for circular of 1870. A. WARREN, Agent, Boston, Mass.



CINCINNATI, O.
MANUFACTURERS OF
SHAFTING, HANGERS, PULLEYS AND COMPRESSION COUPLINGS.
BALL AND SOCKET ADJUSTABLE HANGERS WITH SELF LUBRICATING JOURNAL BOX.
We have Two Hundred and Fifty Pulley, and One Hundred Hanger Patterns of uniform style and weight.
Quality of work equal and Prices lower than any other in the market.
Catalogues sent free, or furnished on application.
LANE & BODLEY,
John & Water Streets, Cincinnati, Ohio.

$60 A WEEK paid Agents in a new business. Address Saco Novelty Co., Saco, Me.

THE INVENTOR'S AND MECHANIC'S GUIDE.—A valuable book upon Mechanics, Patents, and New Inventions. Containing the U.S. Patent Laws, Rules and Directions for doing business at the Patent Office; 112 diagrams of the best mechanical movements, with descriptions; the Condensing Steam Engine, with engraving and description; How to Invent; How to Obtain Patents; Hints upon the Value of Patents; How to sell Patents; Forms for Assignments; Information upon the Rights of Inventors, Assignees and Joint Owners; Instructions as to Interferences, Reissues, Extensions Caveats, together with a great variety of useful information in regard to patents, new inventions, and scientific subjects, with scientific tables, and many illustrations 108 pages. This is a most valuable work. Price only 25 cents. Address MUNN & CO., 37 Park Row, N. Y

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

Harrison *Safety Boiler.*
First-class Medal, World's Fair, London, 1862.
And American Institute Fair, New York, 1869.
Over 1000 Boilers in use.
Address Harrison Boiler Works, Philadelphia, Pa., or JOHN A. COLEMAN, Agent, 110 Broadway, New York, and 139 Federal st., Boston

Office of Wallace & Sons,
Ansonia, Conn., June, 17, 1870.

JNO. A. COLEMAN:
In reply to your inquiry as to how we are pleased with the Harrison Boiler, purchased of you, we would respectfully present a few facts, as the result of careful experiments, made and continued for weeks, for the purpose of determining the practical value of your boiler over others we have now in use. In comparison with a first class tubular boiler, 48 in. in diameter, containing 96 2½-in. tubes, 14 feet long, the economy of fuel in favor of your boiler was as follows:
Tubular boiler, 10 hours, 24,000 lbs. water, 2,700 lbs. of coal.
Harrison boiler, 10 hours, 24,000 lbs. water, 2,125 lbs. of coal.
One pound of coal in the Harrison evaporating 11·29 pounds of water, against 8·88 pounds evaporated in the tubular by the same weight of coal in the same time.
The steam from the Harrison boiler, was also much dryer than that from the tubular boiler, which fact we consider a point much in its favor.
Yours respectfully,
WALLACE & SONS.

CAUTION.
Weston's Patent Differential PULLEY BLOCKS.

75,000 IN USE.
MEDALS: World's Fair, 1862; Paris 1867; N. Y. State Fair, 1867, etc.
Washington, D. C., June 8, 1867.—In an Interference between the claim of T. A. Weston and the patent of J. J. Doyle, the priority of Weston's well-known invention was fully established. The public are hereby cautioned not to buy or use any Differential Pulleys marked
"DOYLE," BIRD, or *"LONGLEY,"*
legal proceedings being now in progress for the suppression of infringement. Parties who have purchased infringements of Weston's patent, may obtain licenses, legalizing the use of the same, upon reasonable terms, on application to
T. A. WESTON,
43 Chambers street, N. Y.,
or his Attorneys, ABBETT & FULLER, 229 Broadway, N. Y.
The genuine Weston's Pulleys have improved hard metal Sheaves durable as chilled castings, without brittleness, and each pulley is tested For terms, etc., address
HARRISON BOILER WORKS,
Philadelphia, Pa.

Caution.
Doyle's Patent Differential *PULLEY BLOCKS.*
We caution all parties using "Doyle's" Pulley Blocks against making any terms with Weston on his assertion of infringement. *"We will protect our customers in the use of every Block we sell."* The interference between the claim of J. J. Doyle and T. A. Weston was decided by the Com. of Pat. in favor of Mr. Doyle on the 18th day of Oct., 1866, and since that official decision, Mr. Doyle has never received any notice of any other application by Weston or of any other interference, and hence a patent cannot have been granted legally to the said Weston. *The celebrated Doyle Blocks have taken premiums* over Weston's and all other makers' blocks at every Fair where they have been exhibited at the same time. We don't use the chilled or very hard metal sheaves, for the reason that they soon wear out the chain, which costs $10·40 on a ½-ton block, and a new sheave only costs $1·25. Orders solicited.
SAM'L HALL'S SON & CO.,
229 West 10th street, New York
Sole Manufacturers.

REPLY TO THE ADVERTISEMENT OF SAM'L. HALL'S SON & CO.

Doyle's Patent was improperly issued. The Examiner's report, June 8, 1867, states "that Doyle's Patent, under the circumstances, no notice having been taken of Weston's caveat, was improperly issued, and that an act of great injustice, unintentially, of course, was perpetrated toward Weston." The report further states that "it is clear that Weston's invention antedates that of Doyle several years." Doyle's legal representatives were duly notified at the interference when Weston's Patent was granted—see the records at Washington—otherwise the case could not have proceeded.
T. A. Weston has never competed with Doyle's imitation Pulley for any Premium or Medal. Messrs. Hall's insinuation that they have taken premiums over Weston is contrary to the facts, like their assertions upon other points.
Weston's pulleys have composite sheaves (not chilled), which do not injure the chain, but possess extreme durability. The ordinary soft metal sheaves soon work unpleasantly and become dangerous. Weston has sued Hall for infringement of his patent. The answer was due 1st of June. Hall's solicitors were not ready and asked more time. T. A. WESTON.
Office of VAN WART & McCOY, 43 Chambers street New York, June 13, 1870.

THE
Tanite Emery Wheel.
Does not Glaze, Gum, Heat, or Smell. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

ROOT'S WROUGHT IRON SECTIONAL
Safety Boiler.
Composed of best Wrought Iron Tubes, tested to 500 pounds; no large sheet iron, shell or thin cast iron to explode. Absolutely safe, economical, durable, and efficient. Send for pamphlet. Also, Steam Engines, Steam Pumps, etc. ROOT STEAM ENGINE CO., 95 and 97 Liberty st., New York.

BAND SAWS.
PATENT BAND SAW MACHINES, MADE by Perin & Co. for Log, Re-sawing, and Scroll. Mongin & Co.'s Saw Blades, in stock and made to order, from ⅛ to 6 inches wide, 50 ft. long. Saws and Machines Warranted.
Also, Taper Files, etc.
All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R.
GEORGE GUEUTAL,
Sole Agent for the U. S., 39 West 4th st., N. Y.

THE SCIENTIFIC AMERICAN is printed with Ink furnished by CHAS. ENEU JOHNSON & CO., Tenth and Lombard sts., Phil'a., 59 Gold cor. Ann st., New York.